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MAY • 1951

The Magazine of TOOLING and PRODUCTION

TOOL & DIE JOURNAL

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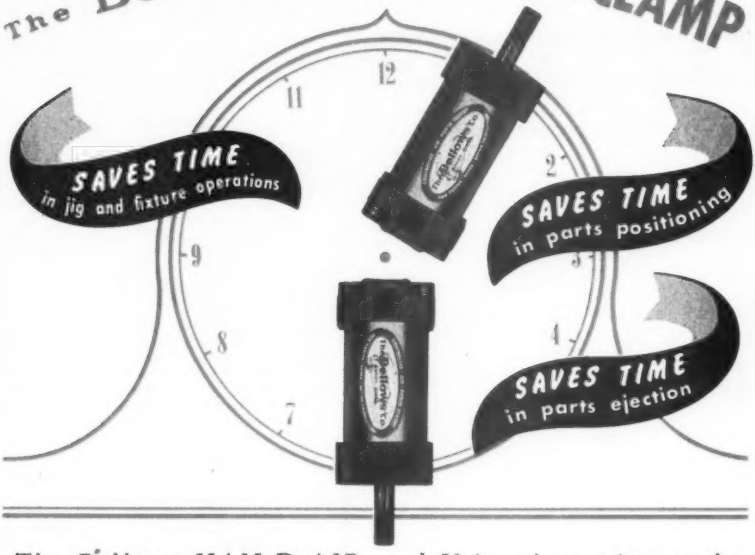

The Bellows HAN-D-AIR CLAMP is a spring return, single acting small air cylinder. 1⅛″ bore develops 100 lbs. of pressure at 100 lbs. of air (Power factor 1 to 1). 1″ stroke. Threaded 5/16″ diameter piston rod. Universal mounting: can be mounted horizontally, vertically, side, front flange, rear flange or front pivot. Overall size 4″ long by 1½″ square. Heavy wall pump finish brass cylinder; ⅝″ aluminum alloy heads; oil resistant piston cup; tension tested spring.

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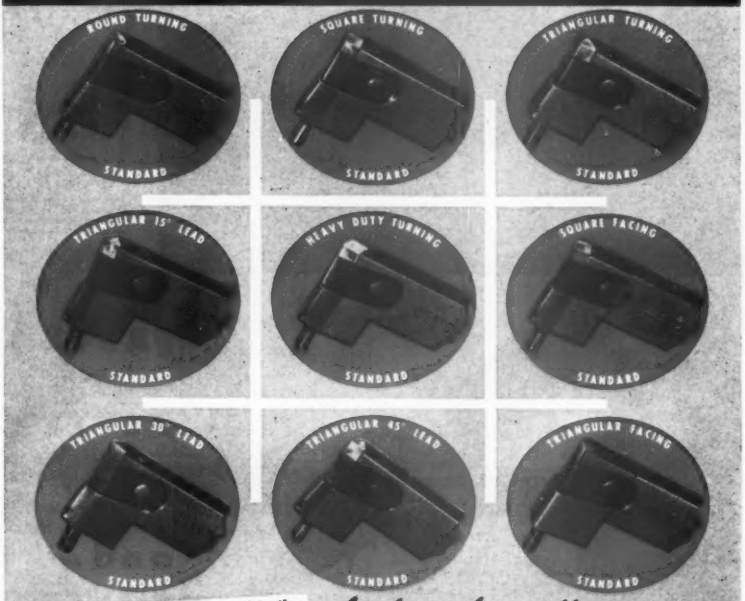

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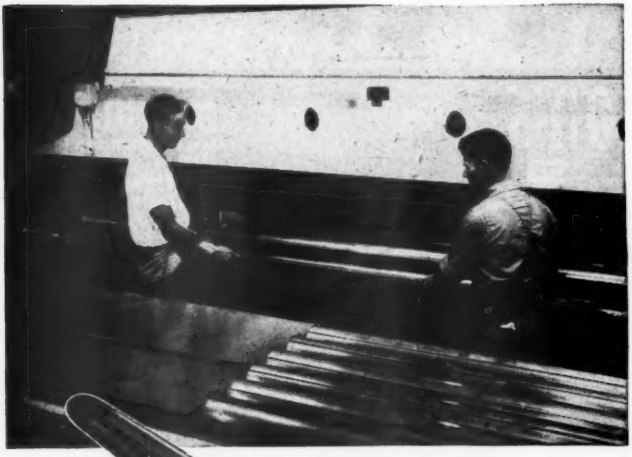

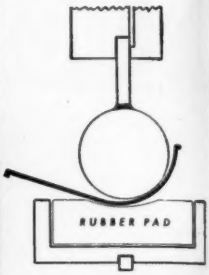

Slots cut in the rubber pad permit forming all length of ducts with preformed end seam flanges and eliminate hand forming.

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FASTER...

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and CHEAPER!

The speed and accuracy of this Cincinnati Press Brake—plus the smart engineering of Temco engineers—saved time and money while bettering the product.

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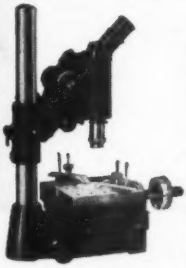

2 TOOLMAKERS' MICROSCOPE

Linear measurements to ±.0001"; angular measurements to ±1 minute of arc, with protractor eyepiece. Simple, quick measurement of opaque and transparent objects of any contour. *Catalog* D-22.

3 STEREOSCOPIC WIDE FIELD MICROSCOPES

Sharp, three-dimensional, unreversed images. Speed and accuracy in small parts assembly operations, inspection of tools and finished parts, and precision machining of small parts. 15 models, widely used in industry. *Catalog* D-15.

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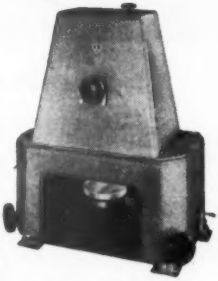

Now you can have "laboratory" accuracy of 0.000001" in the determination of flatness and parallelism of reflecting surfaces... with production-line *simplicity* and *speed.* So simple that an unskilled operator can take measurements after a few minutes of instruction. Two sizes available. *Bulletin* D-224.

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2 DUMORE DRILL HEADS cut multiple-drilling costs in half

for Omco Products Corporation

PROBLEM

This Ohio subcontractor was getting only 90 pieces per hour, drilling 3 holes in a small airplane part. Set-up used was a tumble jig and a 4-spindle multiple drill head.

SOLUTION

Output was doubled and costs cut from $10.95 to $5.82 per thousand by set-up shown above. One Dumore head drills from left, one from right, and hand-press from above. Hand trip controls Dumore heads.

DDH-7

Would you pay $200 to save $5,000 a year . . . $400 to save $10,000? Sure you would. And that's the kind of savings users of small drills report that they are getting with the new Dumore Automatic Drill Head.

We can't tell you how much this revolutionary tool will save you, because we don't know your problems. You'll have to figure the savings for yourself. That's why we're urging you to write for the facts Today!

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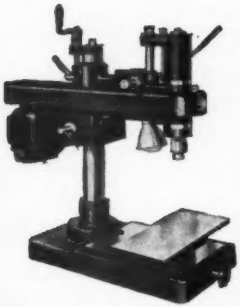
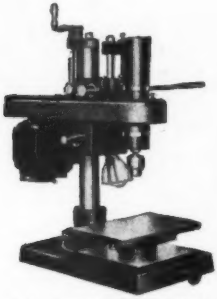
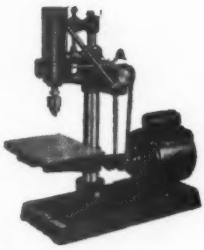


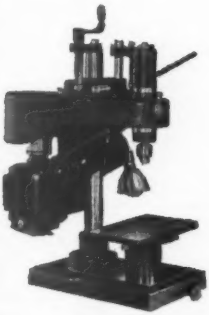
Maximus—Super-Sensitive. Drills holes of .004" to 5/16". Center of chuck to column, 8". Spindle speeds, 750 to 8750 R. P. M.



Maxi-Jr.—Super-Sensitive. Drills holes of .004" to 5/16". Center of chuck to column, 5". Spindle speeds, 750 to 8750 R. P. M. (Special drive for higher speeds available.)

A-M—Super-Sensitive. Drills holes of .004" to .250". Center of chuck to column, 3¼". Spindle speeds, 788 to 9500 R. P. M.





Varimatic®—Super-Sensitive, Variable Speed. Drills holes of .004" to 5/16". Center of chuck to column, 5". Spindle speeds selective between 840 and 9300 R. P. M.

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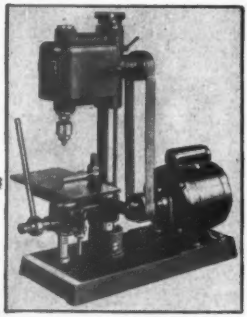

Hamilton Super-Sensitive Tapper. Taps from the smallest and finest to 10-32 inclusive. Center of chuck to column, 3¼". Spindle speeds, 1200 to 2600 R. P. M.

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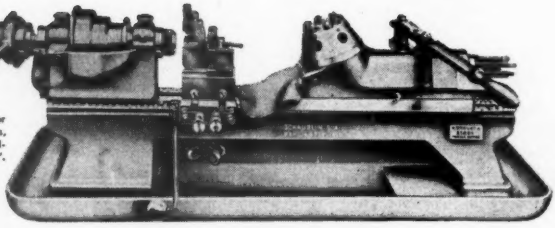

SV 70 Turret Lathe for bar or chuck work. Height of centers, 2.8". Distance between headstock and turret carriage, 8".

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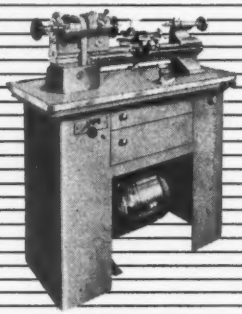
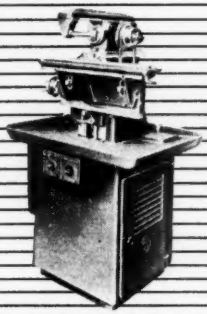
These SV Machines fully warrant your inquiry for complete information. They have contributed greatly toward winning for the Schaublin line a fine reputation for the adaptability and precision that are highly prized by toolmakers. Factory service, interchangeable units and accessories are available from American warehouses. Consult us on your tool-making problems.



SV 102 Toolmakers' Lathe for which great variety of independent and interchangeable units and accessories are available.



SV 12 High-Precision Milling Machine—one of five different types. Table sizes 4-23/32 X 16-1/2" to 10 X 43-5/16"

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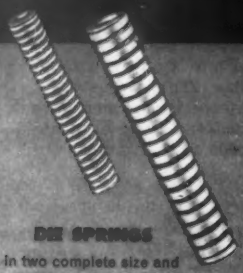

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. . . in two complete size and pressure ranges to simplify die design.

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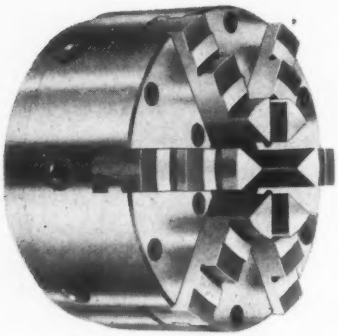


6 Jaw Chuck Handles Work of 93 Collets!

Scroll chuck speed with .0005 precision

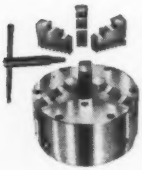
HOW IT WORKS

One pinion (shown in center of chuck body) moves jaws in or out to grip work like any scroll chuck. 4 opposed screws work on the chuck adapter to bring work to dead center. Once set dead true, you can machine hundreds of duplicate parts without changing adjustment. Inexperienced men have centered work within .0005 in 3 minutes!

It's unbelievable—but **TRUE. This one 6" chuck will do the work of 93 collets!** Spindle capacity is from ⅛" to 1½" by .001. Step collet capacity from ⅛" to 5" by .001. In addition, you get the firm grip of 6 jaws, minimum overhang, **and .0005 precision with scroll chuck rechucking speed.** All this at ordinary scroll chuck cost!

It ends most needs for stub arbors and mandrels. It can be used on dividing heads, grinders, screw machines, lathes. Few, if any, developments of recent years have done so much to save machinists time. Send for literature—see for yourself.

BUCK TOOL COMPANY
518 SCHIPPERS LANE KALAMAZOO, MICH.



3 STEP-JAW CHUCK
3 sizes—
4"—light duty
5", 6"—
heavy duty

6 STEP-JAW COLLET CHUCK
3 sizes—
4"—light duty
5", 6"—heavy duty

6 JAW PRODUCTION COLLET CHUCK
3 sizes—
4"—light duty
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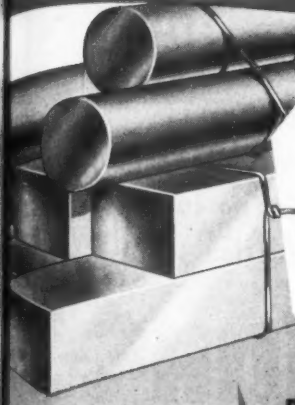

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DESEGATIZED* BRAND

HIGH SPEED STEELS

HI CARBON - HI CHROME DIE STEELS

PICK THE STEEL FOR THE JOB

Latrobe produces a wide range of high speed steels and high carbon—high chromium die steels. Each has different characteristics—different uses. All of them, however, are Desegatized* steels—steels of full structural uniformity. To you, this means more uniform results—increased production efficiency—when you pick the Desegatized Brand steel for the job.

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The right size stock will help you to prevent costly waste of your Latrobe Desegatized Brand steel. "Hogging" cuts from oversized stock waste steel —cause scrap loss—and use up larger sizes needlessly. Minimize this waste—reduce your scrap losses—order, stock and use the right sizes of Latrobe Desegatized Brand steels.

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Use the heat treatment prescribed for your Latrobe Desegatized Brand steel. Heat treating recommendations are the result of years of research by Latrobe's metallurgists and the experience of Latrobe's customers. Proper heat treatment of Latrobe Desegatized Brand steels will give you tools and dies capable of longer production runs—uninterrupted by failures on the job.

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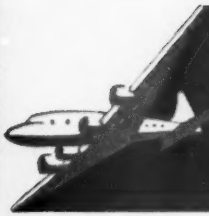
—For the Aircraft Industry!



A NEW, SUPERIOR, LOW-COST, QUICK-SETTIN

Catalin TOOLING RESI

Catalin casting resin 9585, newest member of a group of tooling resin formulations produced by Catalin, is the result of continued research since World War II, for a faster curing, more economical, acid-catalized, thermosetting resin adapted to every phase of sheet fabrication. Aluminum, acrylic, phenolic as well as stainless steel sheets in moderate gauge, can be accurately and inexpensively fabricated with tools cast from this new resin. Stretch Press and Hydroform dies made from Catalin 9585 cut reject losses due to surface scores and impart their own glass-like smoothness to formed parts.

Catalin invites aviation production interests to discuss their individual plastic tooling problems with members of our technical staff. Samples and data sheets are also available to those who wish to make their own experiments.

. . . can be used in every phase o
sheet fabrication to cut tooling cost
and save production time!

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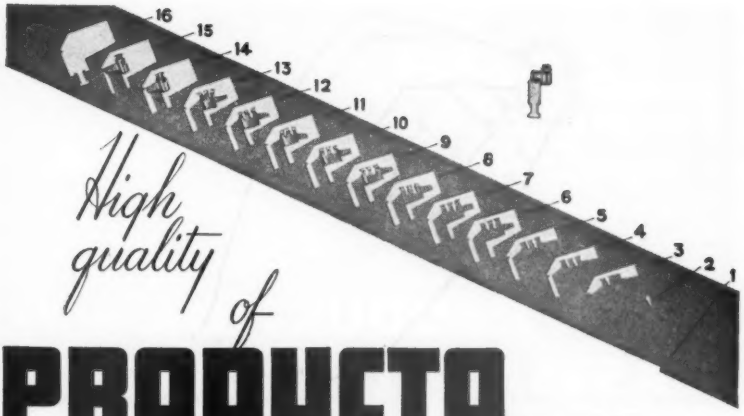
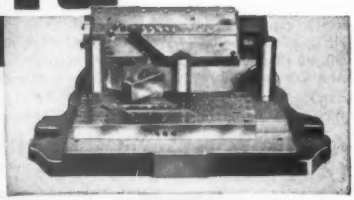


High quality of

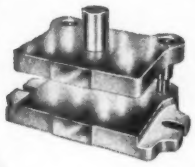
PRODUCTO

DIE SET

PERMITS CLOSE TOLERANCE PROGRESSIVE DIE JOB



This tiny (.502" overall) electrical connector for a miniature radio tube was stamped and curled to form a wire gripping tube from a copper strip 1" wide, .010" thick. The 16 station progressive die* was mounted on a Producto Die Set, so highly accurate that die sections were profile ground to ± .0003" and punches made to fit with clearance of .0002" between punch and die. Only the precision quality of this Producto Die Set allows such close tolerance work.



Call "Producto" in Classified Telephone Directory for Catalog or Special Die Sets . . . fast delivery . . . highest quality.

* Die designed and made by Globe Tool & Gauge Works, Boston, for National Co., Inc., Malden, Mass.

OPERATIONS CHART

1. Notch (for guide)
2. Pierce hole
3. Pierce to shape
4. Pierce to shape
5. Idle
6. Pierce for tube
7. Idle
8. Preform fingers
9. Form tube
10. Form tube
11. Precurl, started
12. Precurl, continued
13. Idle
14. Curl completed (45° angle plunger)
15. Idle
16. Blank out

THE PRODUCTO MACHINE COMPANY
970 HOUSATONIC AVE., BRIDGEPORT 1, CONN.

SEE ADVERTISERS INDEX, PAGE 119, FOR KEY NUMBERS

Let our **ENGINEERING DEPARTMENT** supply the answer to your

PRODUCTION ASSEMBLY PROBLEM

Our thoroughly trained engineers are ready to design equipment for your individual needs . . . No package goods . . . Whatever we furnish you will be planned for your particular purpose . . . And our 25 years of specialized experience qualifies us to do your job successfully . . . Thousands of manufacturers have profited immeasurably through greatly stepped-up production as a result of our service. You, too, can benefit likewise by the use of D.P.S. power-driven machines. Get further details. Mail the coupon today . . . Also send sample assembly for production estimate.

AVAIL YOURSELF OF OUR UP-TO-DATE EXPERIMENTAL LABORATORY EQUIPPED TO SOLVE THE "IMPOSSIBLE"!

POWER SCREW-DRIVERS

NUT DRIVERS

The **SOLUTION** may be tied in with one of our **FOUR MAJOR PRODUCTS!**

HOPPER FEEDING UNITS

SPECIAL ASSEMBLING MACHINES

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2827 WEST FORT ST., DETROIT 16, MICHIGAN
Send your catalog and further details.

COMPANY NAME _____
BY _____
STREET ADDRESS _____
CITY _____ STATE _____

1926 Our 25th ANNIVERSARY 1951

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Meeting the Needs of Industry for More than 60 YEARS!

Back in 1888, Kempsmith was a byword for America's supremacy in milling machines . . . pioneering and perfecting many new machines vital to industry. Today, Kempsmith's matured experience continues to loom soundly on the industrial horizon. You see it in the —

New

KEMPSMITH LH MILLER

— a rugged, yet lightweight milling machine, designed by Kempsmith Engineers for the many "in between" milling jobs. It bridges the gap between low range hand-millers and big, expensive machines . . . combines sound, rigid construction with flexibility and versatility. It's ideal for small end milling, high speed jig boring, keywaying, oil grooving, light straddle milling, etc. Ask for Bulletin No. 127.

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A 5822-1PB-C

SUPERIOR *ALL-STEEL* DIE SETS

and always SUPERIOR IN PERFORMANCE

Superior All Steel Die Sets have Exclusive Design Features that make them the No. 1 Set in the field today. Superior's Lock-Jaw Lifting Device and E-Z Lift Sling Chain makes it possible to move Superior Die Sets of any size or weight . . . for any distance, in any direction (illustration above). Superior's Safety Flange safeguards against crushed fingers . . . acts as a connecting link between die set proper and lifting device (illustration left). Superior All Steel Die Sets are carefully processed to meet individual job specifications . . . your guarantee of the finest in performance. Yes, with Superior you get a **Superior Die Set,** in Less Time, at No Greater Cost. Investigate Superior All Steel Die Sets, Today.

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Free CATALOG

with complete information on Superior All Steel Die Sets and Equipment will be sent to you upon request. Write for your copy of Bulletin No. 850 today.

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KNURLED SOCKET HEAD SHOULDER SCREWS

"HEAD AND SHOULDERS" ABOVE THEM ALL!

UNBRAKO Socket Head Shoulder Screws with **Knurled** Heads . . . are preferred by die-makers everywhere . . . but are useful for many machine applications. Their knurled heads provide a slip-proof grip—even if fingers and heads are oily or greasy—thus materially speeding production.

UNBRAKO Shoulder Screws are available in full range of standard sizes—other sizes to special order.

Write for further details, today.

Knurled Head Socket Cap Screws
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Knurled Head Shoulder Screws
Precision Ground Dowel Pins
Fully-Formed Pressure Plugs

SPS **STANDARD PRESSED STEEL CO.**

Jenkintown 36, Pennsylvania

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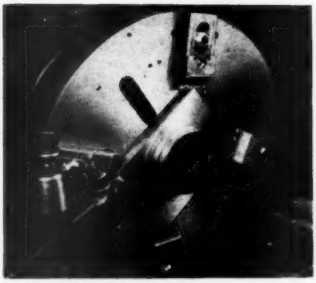
PRODUCTION RATES CLIMB
WITH
NEW J & S JAW CLAMPS

J & S
"All-Purpose"
JAW CLAMPS

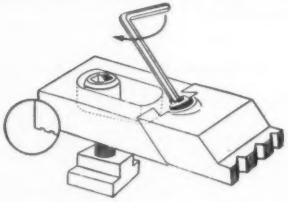
ELIMINATE U-Clamps, Straps & Fingers—also, in most cases, eliminate 4-jaw chuck, vises and special fixtures! For lathes, planers, milling machines & drill presses.



For Face Plate or Machine Table

Typical lathe application. Work-piece removed by simply loosening one screw in each of two adjoining clamps. NO RE-POSITIONING NECESSARY for next piece.

Fastest, simplest—work-pieces held rigidly. Less obstruction, no slipping, because a 1/16" **tapered slot insures firm grip.** Also, angle of jaw travel is 45° to plane of the face plate or table. As the screw is tightened, the jaw forces the work-piece down against the machine surface—**across** against the opposite clamp—this grip is **stronger than that** provided by **eight** U-clamps!



Tested for two-ton down pressure, completely hardened.

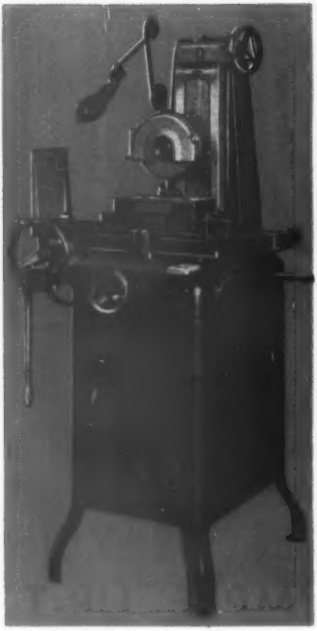
As the drawing shows, jaws of the standard J & S Clamp are only 23/64" thick — allows overall machining to within 3/8" of the machine's working surface! Available in types and sizes to suit all applications. "T" nuts furnished to fit all standard machines.

J&S TOOL CO., INC.
475 Main Street East Orange, N. J.
Representatives in Principal Cities

WRITE FOR NEW FOLDER!
—Contains complete details on advantages, applications, types and sizes available. "Time Saver" booklets, describing J & S "Fluidmotion" Wheel Dressers, etc., also on request.

Proven Superior!

BOYAR-SCHULTZ MODEL 6-12 SURFACE GRINDER



Invites Comparison

Saves more than 20% in time on small jobs

COMPARE:

PERFORMANCE — Flat, accurate surface finish—precision vertical spindle control—fast, easy longitudinal and cross feed operation—less operator fatigue

MANUFACTURE — High alloy castings—precision parts—ground thread screws — protection against abrasive wear — accurate, long wearing ways—high precision smooth running spindle—needle bearings on all hand wheels—precision assembly

APPEARANCE — A small machine with big machine accuracy and performance—fits into any shop—streamlined for easy maintenance—sturdy cabinet

COST — Big machine performance, small machine cost—more value for your tool dollar

BOYAR-SCHULTZ CORPORATION

2112 Walnut St. **Chicago 12, Ill.**

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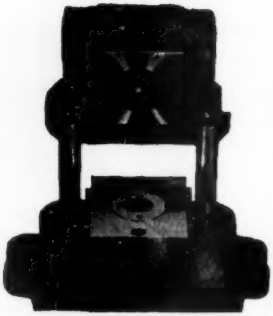
"A MUST wherever WASHERS are made!"

HOVIS

OFFERS YOU THIS SIMPLE, UP-TO-THE-MINUTE METHOD

There's no need to make a complete new Die for any type washer or blank. The HOVIS UNIVERSAL WASHER DIES provide a Master Holder and by merely changing 5 SMALL, EASILY REMOVABLE PARTS the new washer or blank is produced . . . Special sets of parts are available for use in Master Washer Units enabling customers to produce irregularly shaped pieces and shallow draws. Multi-Washer Dies are also designed and manufactured.



Made in 5 sizes:
¼"—1½"—2½"—4"—6".

Write for literature.

HOVIS SCREWLOCK COMPANY

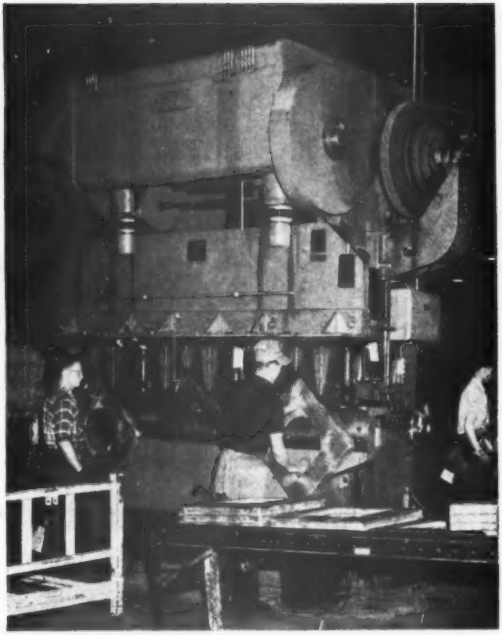
8100 E. NINE MILE ROAD **VAN DYKE, MICHIGAN**
Phone: Slocum 7-1334 **Suburb of Detroit**

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

Can you match these production figures?

THIS Verson PRESS BRAKE TOOL-UP

return flanges 200 washer covers per hour



IN MODERN metal forming procedures, the press brake has become a "Jack-of-all-trades" and a very good one at that. Take the job illustrated above—tops of Maytag automatic washers are return flanged on a Verson Major Press Brake with Verson Tooling—and on a production basis. Yet, as well as the press brake performs on the more complicated jobs, it is equally adaptable to simple bending with runs of just a few pieces.

If you have a forming, bending, coping, notching or punching job, it will pay to consider a Verson Press Brake Tool-Up. There is a Verson Press Brake for every need from 48" of 16 ga. steel up to long lengths of heavy plate. Both mechanical or hydraulic types are available. Verson Press Brake Tooling can be furnished for virtually every shape from a simple 90° angle to the most intricate multi-operation formed sections.

Descriptive literature giving design details and specifications is available. Write for your copy outlining the nature of your problem. Practical, experienced Verson engineering assistance is also available to help you in the selection of the right equipment for your job.

Originators and Pioneers of Allsteel Stamping Press Construction

VERSON ALLSTEEL PRESS COMPANY

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A VERSON PRESS FOR EVERY JOB FROM 60 TONS UP!

Mechanical and Hydraulic Presses and Press Brakes — Transmat Presses — Tooling
Die Cushions — Compression and Transfer Molding Presses

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SHOOT FOR YOUR SHARE OF DEFENSE WORK

Dickerman
AUTOMATIC PUNCH PRESS FEEDS
Can triple the size of your press room!

go after larger contracts

This Rol-Di-Feed is especially adapted to feeding strip stock.

HERE'S HOW!

GREATLY REDUCED OPERATOR COSTS
UP TO 500% PRODUCTION INCREASES

ENABLES YOU

to handle tremendous volumes of production in your press rooms without an inch of increased floor space!

SIMPLE — RELIABLE — ACCURATE

7 models. Mount on any die or press.

NO RESTRICTIONS • NO PRIORITIES

Available from dealer stocks now.

Write for Catalog Today!

Will feed metal without scratching or marring, also plastic, fibre, etc.

•

Gives exceptionally long service. Up to 25,000,000 cycles without maintenance costs or expense.

•

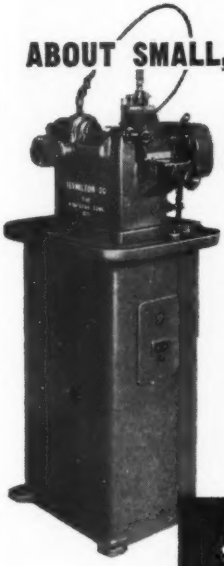
Installation pays for itself in a matter of days in most cases.

H. E. DICKERMAN Manufacturing Co.
823-522 ALBANY STREET, SPRINGFIELD, MASS.

THE MOST NEWS
and
THE BEST NEWS

ABOUT SMALL, PRECISION SPUR GEAR HOBBING

IS YOURS
FOR A MINUTE AND A PENNY



Does your job involve small, precision spur gears? Would you like to produce them fast?

Whether your work calls for long production runs or frequent set-ups, you need to know about the Hamilton No. 00 Precision Spur Gear Hobber. Spend a minute now to send your request for a copy of our Bulletin No. H-00-49. Acquaint yourself with this efficient tool, and be ready for the challenge ahead.

NOTE: If you are interested in helical gears, worm gears, bevel gears, and crown gears, as well as spur gears, ask for Bulletin H I-49. No obligation.

THE *Hamilton* TOOL COMPANY

832 SO. NINTH STREET • HAMILTON • OHIO • U • S • A

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"DETROIT" standard die sets are Micro-metric jig-bored and machined to exceptionally close limits of parallelism, flatness and squareness with the guide-pin axis. This precision reduces strain warping, and results in longer die life and long, uninterrupted production runs. Order from your "DETROIT" representative.

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PITTSBURGH - Perrysville	4-5111
ROCK ISLAND, ILL.	R.I. 8-2814
ST. LOUIS	FR 6811
ST. PAUL	CE 1600
SAN FRANCISCO	EX 2-7018
SEATTLE	MU 2450
TOLEDO	GA 5706
TORONTO, CAN.	PL 3813
WICHITA	5-8682
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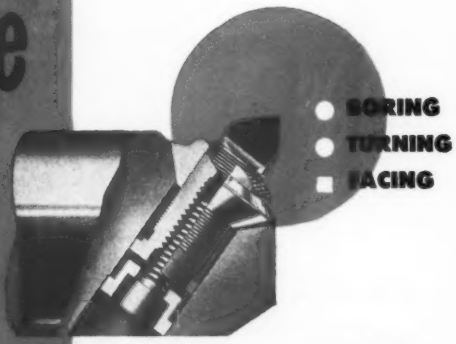
DETROIT DIE SET CORPORATION
2895 W. GRAND BLVD. • DETROIT 2, MICHIGAN

DETROIT DIE SET ★

Microbore aids defense conversion



Each tool independently adjusted by proven micrometer, vernier principle.

In your conversion to defense work take advantage of Microbore tools to solve your precision boring and turning problems.

Standard and Special boring bars are available with Microbore tools.

In many cases, Microbore Units can be installed in your existing boring bars. This provides an economical method of converting your present tooling into the precision tooling required for your most exacting work.

There is a Microbore representative in your area who will be pleased to call on you for further consultation.

ILLUSTRATED CATALOG MAILED ON REQUEST.

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MICROBORE by DE VLIEG

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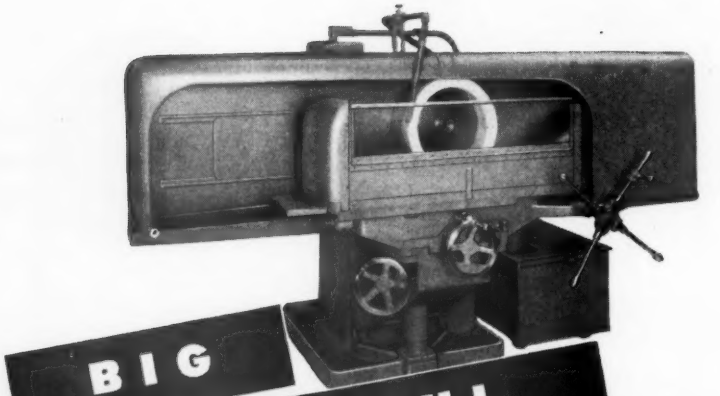


BIG POWERFUL PRODUCTIVE

ABRASIVE 18" FACE GRINDER

Put face grinding work on the machine that's specially built to take it — the Abrasive 18" Face Grinder. It's big, rugged, and powerful. The 18" wheel, with its 15 HP Motorized Spindle, "eats" through the toughest jobs: castings, auto body dies, plastics dies, fire brick, ceramics, forging dies, and any other work where flat, square surfaces are required. Set up is fast and easy. Hand feeds eliminate time-consuming adjustments — help speed the production of short runs and one-of-a-kind jobs. Use the 18" Face Grinder for snagging, heavy cuts, or accurate fine finishing. Write today for complete details and price information. ABRASIVE MACHINE TOOL CO., 16 Dunellen Road, East Providence 14, Rhode Island.

Important 18" Face Grinder Features:

Work Table Surface: 13" x 36"

Motorized Spindle: Extra-heavy design with pre-loaded ball bearings; built-in 15 HP 900 R.P.M. motor

Wheel Size: 18" diam., mounted steelback

Feeds: All hand feeds — transv. 3½"; vert. 7¼"; long. 24"

Standard Equipment: Complete wet grinding attachment with 60 gal. tank, motorized pump, unique table water guards, wrenches, etc.

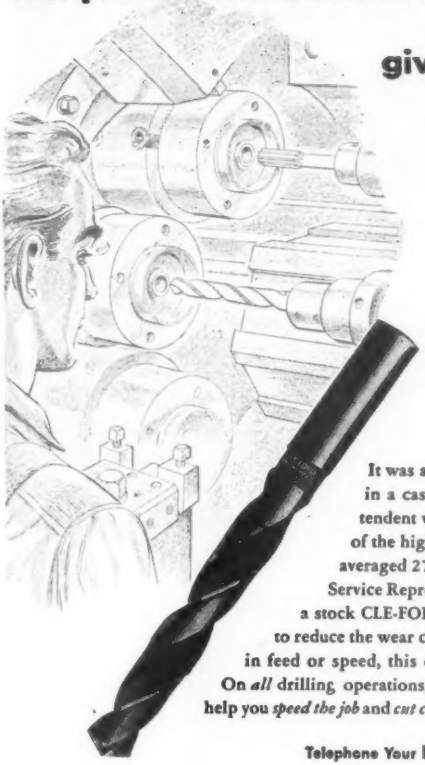
Net weight: 3900 lbs.

ABRASIVE

ACCURACY BOOSTS PRODUCTION

Abrasive Quality is Reflected in the Finish of Your Product

test proves that *Better Wearing Qualities*



give you

42%

MORE HOLES PER GRIND

It was a smooth-running job—drilling 1⅞" holes in a cast iron cover, ½" thick—but the superintendent wasn't satisfied with the wearing qualities of the high speed drills that were being used. They averaged 2705 holes per grind. ◈ When a *Cleveland* Service Representative was called in, he recommended a stock CLE-FORGE High Speed Drill that is engineered to reduce the wear caused by abrasive action. With no change in feed or speed, this drill averaged *3862* holes per grind! ◈ On *all* drilling operations, a *Cleveland* Service Representative can help you *speed the job* and *cut costs*. Contact our nearest Stockroom, or...

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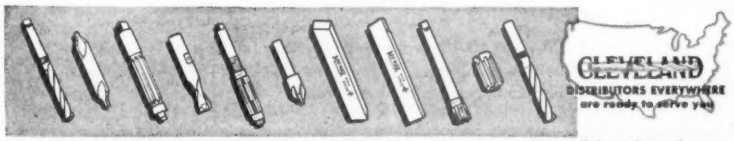

ASK YOUR INDUSTRIAL SUPPLY DISTRIBUTOR FOR THESE AND OTHER *Cleveland* TOOLS

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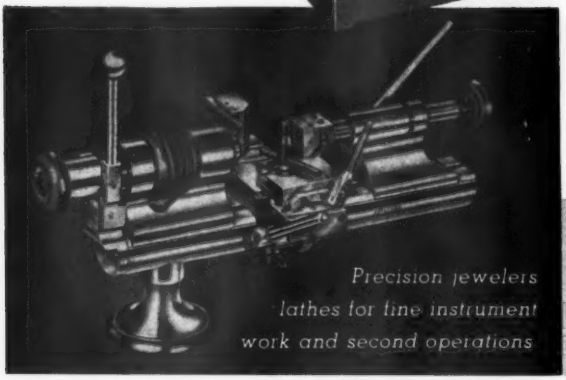
LEVIN® TOOLS ARE DESIGNED
TO MAKE DELICATE PRECISION EASIER

MICRO-DRILL PRESS

The Levin Micro-Drill Press is designed to hold small drills in precision collets, thus overcoming the difficulty of getting a drill to run true as when held in a conventional drill chuck. The absence of a sliding quill guarantees maximum sensitivity with fingertip control. A mounted ⅛" capacity drill chuck can also be used. WRITE FOR BULLETIN H DESCRIBING THE MICRO-DRILL PRESS and listing collet sizes.

for drilling holes as small as .002"



Precision jewelers lathes for fine instrument work and second operations

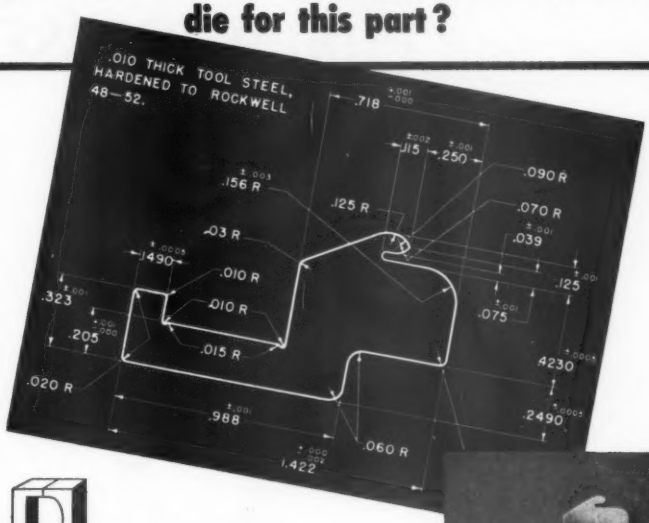
SEND FOR CATALOG E DESCRIBING LATHES AND ACCESSORIES

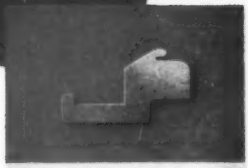
COMPLETE CATALOG illustrates and describes full line of accessories: Compound Slide Rests, Grinding, Milling and Screw Cutting Attachments, Cross Slide, Collet Closer and other useful items.

LOUIS LEVIN & SON INC., 782 E. PICO BLVD., LOS ANGELES

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

How long would it take you to form grind a die for this part?





THE DUPLIform METHOD DID IT IN 40 HOURS!

This part had to be stamped from .010" tool steel hardened to Rockwell C-50. Tolerances had to be as close as plus or minus .0005", and edges free of burrs.

With the DUPLIform method, form wheel dressing and form grinding the high carbon, high chrome punch and die for this part required only 40 hours. A *sample part* was used as a template to form grind the die sections and the stripper. The stripper sections, in turn, were used as templates to form grind the punch. Tenth-splitting accuracy was achieved in fitting punch to die.

DUPLIform is the simplest, most accurate, most economical method of reproducing intricate form ground contours of extreme precision, combining, as it does, a profile surface grinder of tenth-splitting accuracy with a built-in universal dresser.

Write today for Bulletin 201.

AIRBORNE
ACCESSORIES CORPORATION
TOOL DIVISION
1414 Chestnut Avenue, Hillside 5, New Jersey

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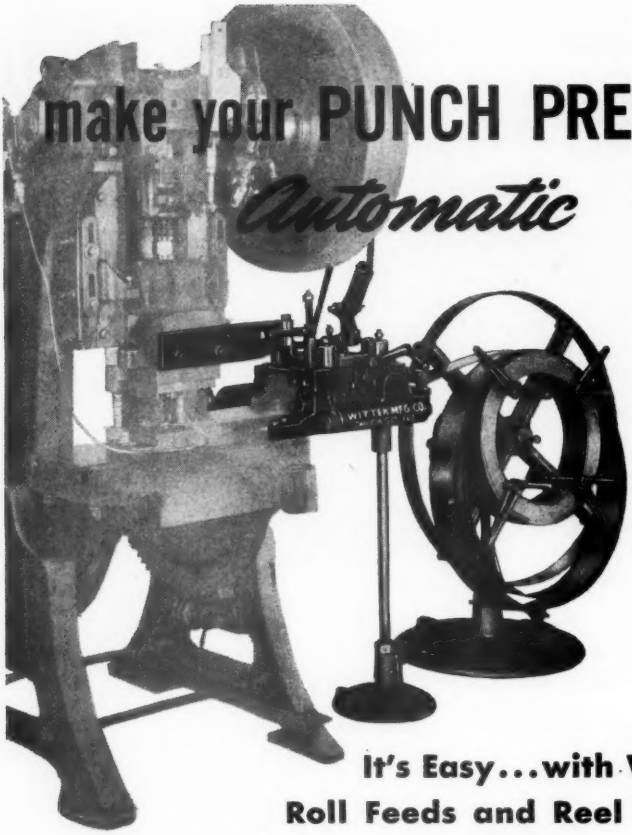
make your PUNCH PRESSES *Automatic*



It's Easy...with WITTEK Roll Feeds and Reel Stands

Wittek Roll Feeds handle any type of coiled strip stock and are made in single roll, double roll, and compound types with straighteners, in models to feed in any of four directions. They are reliable and accurate with simple, quick adjustment of feed length. Standard sizes and models meet a wide variety of press size and capacity conditions.

Wittek Reel Stands facilitate handling coiled stock.

Write for full particulars

WITTEK Manufacturing Co.

4323 W. 24th Place, Chicago 23, Illinois

Automatic ROLL FEEDS AND REEL STANDS WM CO.

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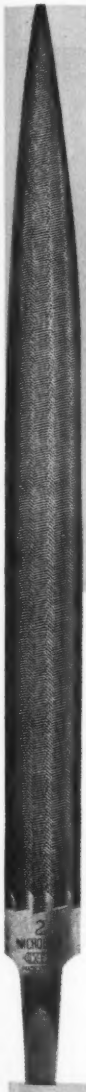

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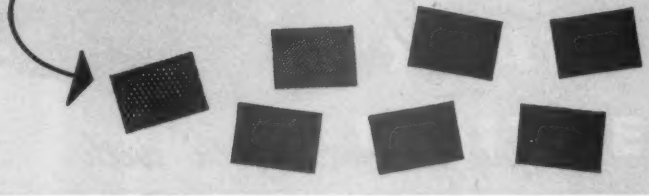

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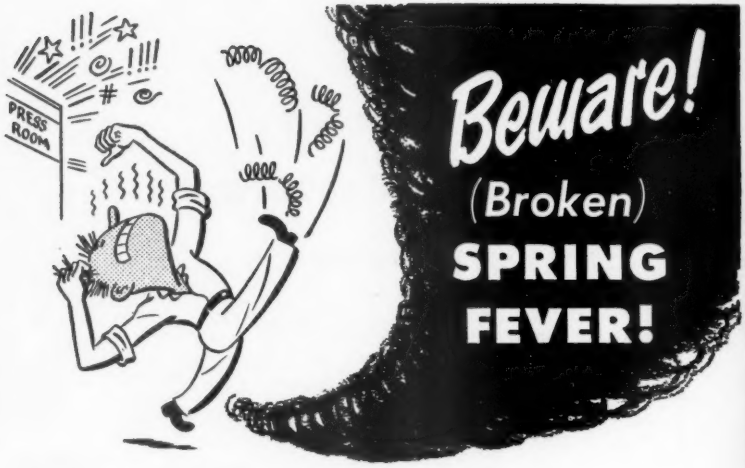

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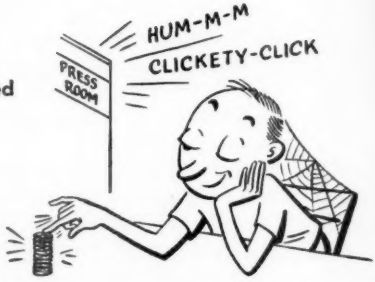

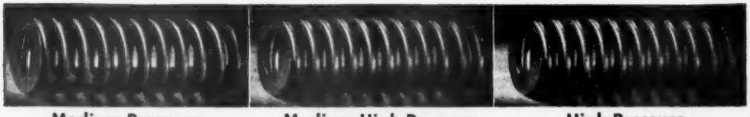

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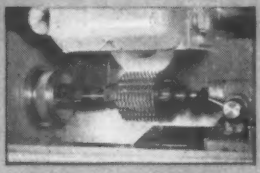

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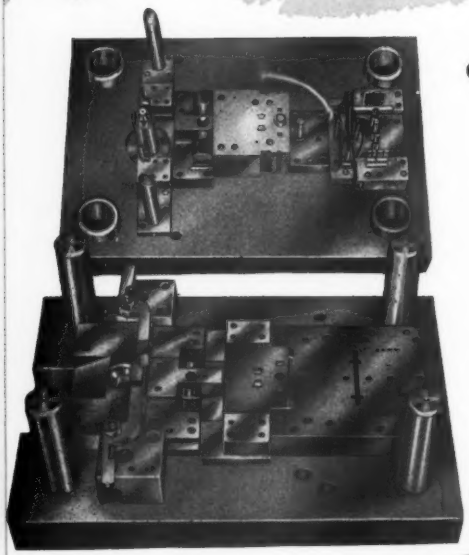

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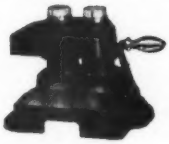

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Here we've practically put some of today's newest literature up on a rack ready for you to take your pick.

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Here's a wealth of information, but too much to carry in your head. Study it over and file it; then you'll have it when you need it.

"PROGRESS ON PARADE"....154
Each and every one of these new machines, tools and accessories is capable of saving money or increasing productivity on a job that may be baffling you; or of performing a new job that has come up.

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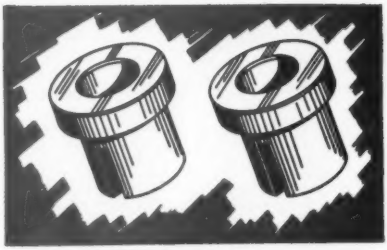

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"X" marks the spot

As a nation governed by elected officials and their appointees we get by voting (or not voting) just what we ask for at election time; no more, no less.

At any and all times, election or no election, it is appropriate to ask: "What have we got in the way of competent government?"

1951 is not an election year; this month of May is not of political significance; and the editorial page of a metalworking trade magazine isn't looked upon as a political sounding board. But neither is it a refuge from realities—the political facts of life.

We are all in the same boat, writer and reader. We are all subject to the same government. And we all participated on election day in 1948 in "tooling it up for a four-year production run." So, the question becomes, "What did we set up in the way of a competent government?" Did we do a job which in design, efficiency, quality and performance is at all comparable to the job we exact of ourselves in the daily earning of our "take-home"?

We have gotten, and between now and the next elections will continue to get, some amazing and shocking answers.

Recent court trials, senatorial investigations and hearings have disclosed that what "couldn't happen here" has become the standard operating procedure of an undercover government that is destroying everything that makes our free tenth of the world any better than the enslaved nine-tenths.

Although this undercover government is unofficial, unconstitutional and anonymous, it is of terrible force and energy. It is being shown to be motivated by the greed of unprincipled individuals for power and wealth—however ill-gotten. It seeks to perpetuate itself by effecting a liaison between organized crime and government officials, both elected and appointed, which when disclosed in open hearings was shown to be of a magnitude and extent next to unbelievable.

A most useful tool of this undercover government has been political patronage. We have seen where pressure has been brought to bear to put incompetents into responsible positions; to "get something on" a conscientious official; to thwart earnest endeavor and to smear reputations.

It is all part and parcel of a growing mediocrity in government that has permeated all levels: town, county, state and federal.

The domestic and international problems that confront us today are an unprecedented challenge to the best in brains, character, judgment, ideals and morality that can be mustered for the jobs that need doing.

There is no room for mediocrity. Mediocrity thrives on apathy; the apathy of the non-voter.

"X" is quite a symbol. It is accepted as the signature of a person too illiterate to sign his name. In mathematics it denotes the unknown quantity. And on the election ballot, "X" marks the spot whereby you indicate your approval or disapproval of the way your government is being run.

Which is worse? The compulsory "elections" as manipulated in the enslaved countries where the "ballot" offers no choice, or—in a democracy where a free and voluntary electorate ballots on a choice of candidates and issues—for the predatory politician to be able to gain office and power not because of the voters, but because of the non-voters?

In end results, in terms of the freedom, enterprise and well-being of a people there isn't much difference.

E. Willard Pennington

Publisher

Preventive Maintenance on Machine Tools

Basically there are two types of maintenance, **preventive maintenance** — that is, doing things so that break-downs or wear and tear will not occur or, at least, be kept to a minimum, and **corrective maintenance** or repairs to a machine after a parts breaks or a unit fails to function.

Corrective maintenance often proves to be a costly item, both from the standpoint of production lost on the machine, the cost of repair parts and the time spent in dismantling and re-assembling the parts, unit or machine, as the case may be. Furthermore, the shut-down of one machine often interrupts the flow of production to other machines, upsets schedules, and necessitates the shifting of operators to other work.

It seems obvious that **preventive maintenance** can do much to eliminate many of these difficulties and items of unnecessary expense. However, all too often, it is found that even the simple task of changing oil at periodic intervals, or of making minor adjustments, is neglected and that no regular program of preventive maintenance is in effect. For example, Figure 1 shows a hydraulic unit from a milling machine which was returned for repair. This unit had been in the machine for several years, and, judging from its condition, there probably had been no maintenance whatsoever and, apparently, the oil had never been changed. When dismantled, it was found that sludge covered the entire unit and that none of the moving parts could be used. Here was a major repair job that could have been prevented.

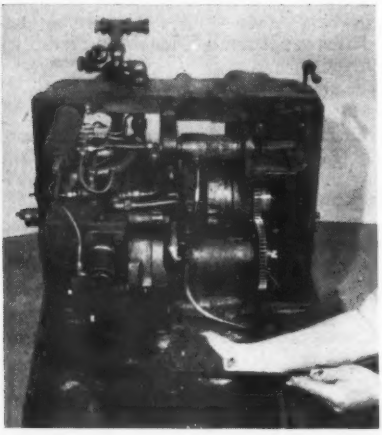


Fig. 1. The major repairs necessary on this sludge-contaminated hydraulic unit were due to lack of proper, systematized maintenance.

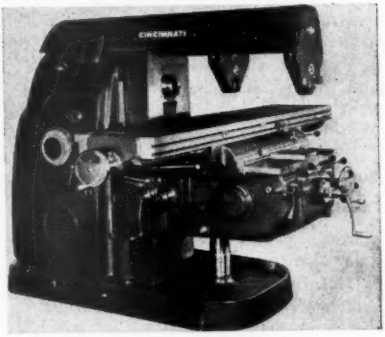


Fig. 2. The modern machine tool has many built-in maintenance features which, when taken advantage of, will protect the investment.

Machine tool builders have accomplished a great deal by designing features into the machines as aids to preventive maintenance. However, there are certain functions which the user can and must do if the machine is to maintain its efficiency over long periods of time.

Figure 2 shows some of the preventive maintenance features built into a modern knee and column milling machine. Adequate oil reservoirs in the arbor supports, one-shot lubricating systems for the table and saddle ways, a vertical

by **J. Howard Groom**
Manager, Field Service Department
Cincinnati Milling and Grinding Machines, Inc.

screw enclosed in a bath of oil, and automatic lubrication of the moving parts within the column serve to reduce friction and wear and to maintain the original accuracy of the machine.

Similarly, pressure lubrication is provided for the ways of center-type grinders and case after case could be cited to show how preventive maintenance features have been included in the design of the modern machine tool. Nevertheless, **the responsibility for seeing that these features are properly used and that regular inspections and adjustments are made, still remains and must continue to remain in the hands of the machine tool user.**

What Can The Machine Tool User Do?

Lubrication. Under the heading of lubrication, there are a number of points should be covered.

1. Use the correct grade of oil or grease as recommended by the machine tool builder.
2. Keep oil reservoirs filled to correct level.
3. Follow instructions of machine tool builder as to schedule for lubricating each different unit or part of the machine.
4. Clean oil strainers and replace filters at regular intervals.
5. Change oil at stated intervals.

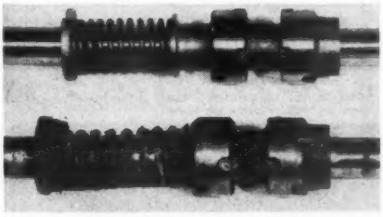


Fig. 4. The lower gummed-up valve shows the effects of not using the correct oil and of not changing oil at correct intervals.

Most machine tool builders furnish Operator's Instruction Books and Service Manuals on their standard machines, see Figure 3. In addition to operating instructions, the manuals usually contain lubrication charts with specific recommendations on the five points mentioned above and information relative to hydraulic units.

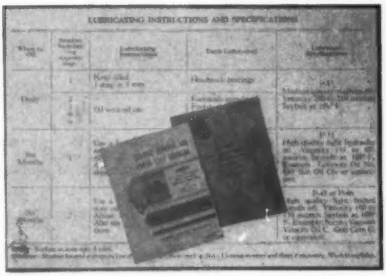


Fig. 3. The Operator's Instruction Books and Service Manuals are authoritative guides to maintenance and trouble-free performance.

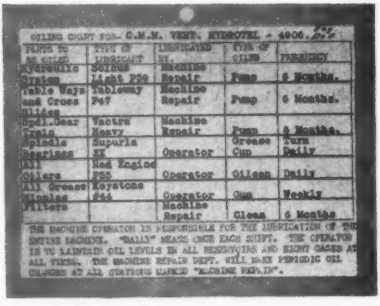
Hydraulic Systems. The application of hydraulic systems to machine tools has made a worthwhile contribution to their simplicity, ease of operation, safety, accuracy and productivity. However, experience indicates that many unnecessary troubles and expenses have been caused by the lack of proper preventive maintenance. In a paper* entitled "The Maintenance and Servicing of Hydraulic Systems for Machine Tools," presented by the writer at the November meeting of the A.S.M.E., it is stated that the majority of service calls on hydraulic units can be traced to two main sources. These are:

1. The use of the wrong hydraulic oil

(continued on page 113)

*A reprint of the paper may be obtained by writing to the Technical and Service Publications Department, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

Fig. 5. Lubrication charts and a maintenance department filing system will make easy the establishment of a successful service program.



OILING CHART FOR- C.M.M. VERT. HYDROTEL - 4806.

PARTS TO BE OILED	TYPE OF LUBRICANT	LUBRICATED BY	TYPE OF OILER	FREQUENCY
Hydraulic System	Solnus Light 250	Machine Repair	Pump	6 Months.
Table Ways and Cross Slides	Tableway Oil	Machine Repair	Pump	6 Months.
Spdl.Gear Train	Vactra Heavy	Machine Repair	Pump	6 Months.
Spindle Bearings	Superla XX	Operator	Grease Cup	Turn Daily
All Others	Red Engine 250	Operator	Oilcan	Daily
All Grease Fittings	Keystone 444	Operator	Gun	Weekly
Filters		Machine Repair	Clean	6 Months

THE MACHINE OPERATOR IS RESPONSIBLE FOR THE LUBRICATION OF THE ENTIRE MACHINE. "DAILY" MEANS ONCE EACH SHIFT. THE OPERATOR IS TO MAINTAIN OIL LEVELS IN ALL RESERVOIRS AND SIGHT GAGES AT ALL TIMES. THE MACHINE REPAIR DEPT. WILL MAKE PERIODIC OIL CHANGES AT ALL STATIONS MARKED "MACHINE REPAIR".

Each brush application, whether it be removal of burrs, sharp corners, marks or scratches, or the improvement of surface finish, must be engineered. There are many different types of brushes, each capable of a specific job at optimum rate and power conditions.

Power Brushing as a Production Tool

Brushes have been used for a long time to remove burrs and scale and for doing similar work, but their acceptance as a production tool is a more recent development.

Slow, laborious methods had become the accepted standard, and as a consequence much time and labor was lost. But with the demand for increased quantity and quality in production, plants using the slow methods found that burr and scale removal slowed up the production line. As a result, the application of power brushing tools has increased many times to fast methods using automatic equipment.

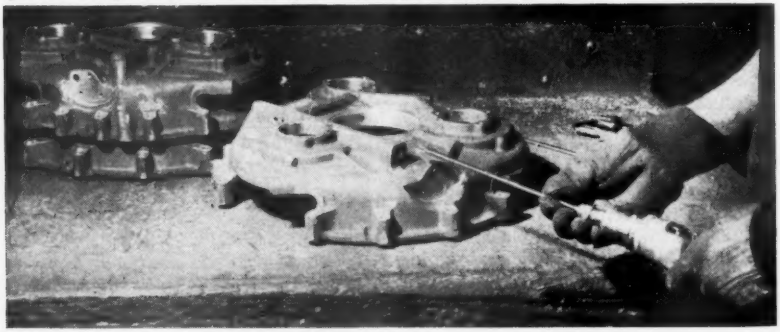
To relieve production bottlenecks, especially in the manufacture of precision parts, many new applications have been worked out by the engineers and technicians of the Osborn Manufacturing Company, Cleveland, Ohio.

Each application, whether it be removal of burrs, sharp corners, tool-marks or scratches, or the improvement of surface finish and detection of cracks, must be engineered. There are no specific rules that can be set up to cover the many variables surrounding the use of brushing wheels as production tools. Each job has its own characteristics, and each must be studied by someone familiar with power brushing technique, construction of brushes, and effects of brushing speed, brush size and manner of presenting the work to the brush, which may be used with or without abrasive.

Selection of a power brush for a given application is done best after compiling information along the following lines:

1. What is to be accomplished?
   (a) Clean or remove—what material?
   (b) Roughen or smooth—what kind of surface?

Fig. 1. Narrow, deep cavities are easily cleaned with a ¼" diameter Situft brush, .005 wire, operated on a portable tool at 6000 rpm. Brushing can detect cracks or flaws.



(c) Finish or polish—to what degree?
(d) Round corners or blend surfaces—how much?

2. What kind of equipment is available?
(a) Brushing lathe—what horsepower and speed?
(b) Automatic brushing machine—what type?
(c) Portable or flexible-shaft equipment?
3. What are the properties of the material involved, especially hardness?
4. At what rate and under what conditions must the work be done?

The answers to these basic questions will usually furnish the facts necessary to determine brush type and material and the brushing technique required.

Brushing wheels can produce a wide variety of finishes, depending on wheel material and how the wheel is applied. Coarse-wire wheels serve to rough-off burrs, scale, rust, welding scale and welding flux. Fine-wire wheels, with or without abrasive, are employed for removing small burrs, rounding corners slightly and producing finishes in proportion to the wire gage and abrasive grain size.

For rough, heavy cleaning, coarse-wire brushes of cup or radial construction are employed with electric or air tools operated at optimum rate to obtain quick results and long brush life. If the job is one of removing surface imperfections with minimum change in contour, consideration must be given to the flexibility of the brush fill. This may be wire, fiber, cord, nylon, hair, or certain combinations of these. It is also well to remember that harshness of the brush face increases as the trim, or effective, length of the brush material is decreased. Thus to penetrate crevices or recesses it is necessary to employ a long trim brush operated preferably at low speed.

Excessive application pressure shortens the life of the brush by causing excessive flexing of the brush material. Correct usage calls for touching the work to the brush as lightly as will give the desired results.

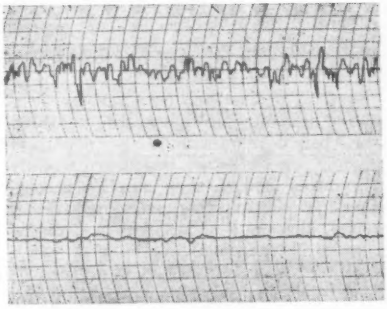


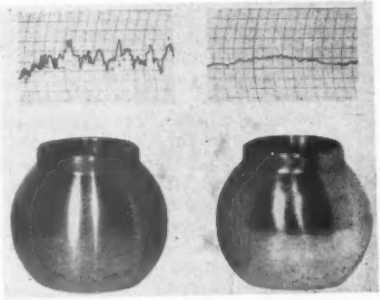
Fig. 2. Upper chart shows in micro inches the roughness of a surface finished with a polishing wheel. Lower chart shows the roughness in micro inches of a surface finished with a polishing wheel followed by a brushing operation using fiber brushes with compound.

If the metal is too hard to be cut effectively with wire brushing wheels, abrasive compound is applied directly to the wire, fiber, or cord section. In selecting an abrasive compound, variations in grain and suspending medium must be considered. Some compounds are glue bound, others grease bound. Conditions of the application may require use of aluminum oxide, iron oxide, emery, or other abrasive, in paste or stick form, as a liquid or even dry.

Besides removing blemishes, brushing wheels can be employed to detect cracks

(continued on page 96)

Fig. 3. Torque rod bearing balls before and after brushing to refine ground surface. These balls, which operate in sockets having nonmetallic linings, were finished to this low friction surface by cord brushes before assembly.



AUTOMATION AT FORD (continued)

DEVELOPMENT OF AN AUTOMATION SYSTEM

Systems of the kind we have just considered may appear quite simple. However, their development is very often not a simple process. Much engineering study is required before they can be accomplished. To explain the development work needed, a resume of the way we handle a new program should be helpful.

At the present time, we have specialists who concentrate on automation design work. A good man in this field must have imagination, engineering knowledge, design experience and at least a small amount of "Rube Goldberg" in him.

by **William B. Slattery**
Manufacturing Engineering Staff
Ford Motor Company
Dearborn, Mich.

With this type of man and a program available we are ready to start work. The first step occurs when the general plant layout has been agreed upon and detailed layouts are in their early stage. One Automation Engineer should be given the responsibility for the work on a complete part. In this way, he will be able to get the overall picture of the job rather than a partial view. Naturally, on large jobs, the man in charge of a particular study will need help.

In preparing the detailed plant layout at this point, the layout man should call on the automation man freely for consultation as the layout progresses for developing arrangements which lend themselves to simple equipment designs. At this stage, other interested parties from production, higher management, etc. are brought in for their comments to see the overall plan under consideration. Many quick calculations and simple sketches are made here if necessary to determine in a preliminary way the extent of automation which is justified on the basis of the overall need, economies, etc.

In some cases, it is found that the right type of automation equipment will cost no more than standard conveyances which would have to be used anyhow. The value of close coordination on the program at this point, therefore, cannot be over-emphasized.

The parts must be carefully analyzed for adaptability to the automation, and preliminary manpower estimates must be considered. We might find, for example, that if one operator can load and unload several or more machines, or if an operator is required for reasons other than loading and unloading such as assembly, manual control, observation, etc. automation may not be necessary.

Let us assume that our preliminary study indicates the need for a system. Our preliminary work is done and we are now ready to do the real job.

Copies of the plant layout are made and the engineer starts his detailed study for preparation of the final recommendation. He must have copies of the Process Sheets utilized on the job to be certain of obtaining correct machinery information as the job develops.

An overall preliminary automation layout is made to show all of the elements required, location, approximate size, etc. In some cases, it is necessary to make small scale models of the proposed equipment. Generally, we find the need for three dimensional drawings to be certain of some features and to make proper presentation as required to Management for approval.

When we feel that our overall study is completed far enough for final evaluation, the entire job is turned over to our estimating department for cost figures.

Our Industrial Engineering Department analyzes the manpower required for the entire departmental layout, both with and without automation to show the actual requirements.

When we get answers to these two items we are then prepared with the following data to make a report:

(Continued on page 51)

AUTOMATION OF Piston Production . . . . .

This department is typical of one that was rearranged utilizing 100% of existing or standard machines not originally designed to be used with automation. It is also typical of a job which required a considerable amount of field check, layout work on details and follow-up in the field afterwards.

The entire system is basically an extension of many of the principles of conveyor design with the automation designers' technique added to feed the machines. This system had made it possible to have one operator handle several groups of machines in several cases.

Here and over the page is the complete picture story of the major transfer points.

Fig. 1. This shows what can be done in properly locating stock by the operator. By simple arm motions, the operator can load his machine and unload it to the overhead conveyor for delivery to the next operation. Operation: Turn O.D., face dome and skirt and turn ring groove.

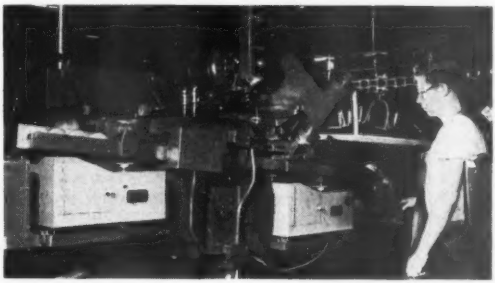


Fig. 2. Here again, simple arm movements can load and unload the machine in the second operation. This machine automatically weighs the piston, delivers it to the drill for removal of weight if necessary, locates it and then discharges it. Automation is within the machine. The operator sets the completed part on the belt conveyor.

Fig. 3 Automation here is simple but effective. A group of No. 5 Centerless Grinders is automatically loaded with a deflecting unit which keeps the machine loader full. A turning device has been installed to position the work. Discharge is automatic.

AUTOMATION of Piston Production . . . . .

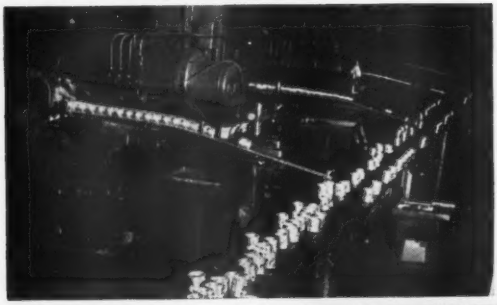


Fig. 4. Automatic unloading of the Centerless Grinders can be seen here. The belt conveyor picks the parts up and by means of deflectors starts them down another system.

Fig. 5. Continuation of the system shows distribution to a group of Excello boring machines, all completely automatic.

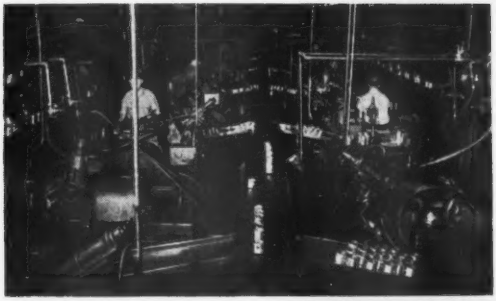


Fig. 6. A group of No. 2 Cincinnati Cam Centerless Grinders is kept supplied by the same system of belt conveyor and deflecting units. This eliminates handling of each individual piston from the conveyor and insures the operator of a supply on hand at all times.

Fig. 7. A simple arrangement to simplify motion in loading and unloading a four spindle continuous chucking machine. This picture shows a type of overhead conveyor which is used to save handling in the next operation which is that of the automatic tin plater. From there, the parts proceed to delivery to the automatic final inspection gage.

(Continued on page 60)

. . . automation, from page 48

(1) Equipment costs installed.

(2) Savings to be made and other benefits, needs, etc.

(3) Preliminary layouts.

(4) Details of some items which were made to be certain of their practicability.

(5) Some three dimensional drawings.

(6) Possibly, some scale models.

This data is all summarized. The proper supervision within the department and in other divisions of Management are consulted for approval as required.

Let's assume that we have a program which has reached this point and has been approved. When this occurrs the following are the major steps that are taken.

(1) The Plant Layout Section is notified of the approval. Consultations are held so that the necessary final revisions to the layout or to the automation can be made before proceeding with the necessary steps to procure equipment.

(2) The Process Department is notified so that operation sheets can be revised to include the effects of the automation equipment.

(3) Tool and Die Design is notified. Consultation takes place here to be certain that there is proper coordination. This is important so that proper clearances are left in dies and tools for introduction of automation devices to load and unload and in some cases, to allow for the rejection of scrap material.

(4) The final automation layouts are made.

(5) It is the policy of the Ford Motor Company to write Purchase Notices at the source of design so that Purchasing Engineering can obtain proper bids.

(6) These Purchase Notices are written to set up general specifications for the job. They include all those general features necessary to a clear understanding of the job. Prints of the final approved layout are included.

(7) The P.N.'s as they are known, clearly define the part under consideration, the work to be done, the materials required, etc. A description of each automation devise is clearly given and an explanation of the function intended is given.

(8) A point worthy of special consideration at this point is the general policy that the contractor shall completely design, fabricate, machine, deliver and install all of the automation equipment and test it before acceptance by the Company.

This point is of utmost importance. We have seen that this type of equipment must be carefully designed from start to finish and is a key item in the production process. It is not good business to split responsibility in jobs of this kind. There are cases, however, where it is good policy to work out many details beforehand to fully explain the job and indicate the extent of the job to the bidders.

Naturally, as the successful contractor progresses on the job there are consultations with the Design Section originating the work and the Purchasing Department who placed the order and later, follow-up in the field to see that the job will operate as planned.

The above outline assumes that the entire job was to be fabricated by contractors outside the Company. This is not always the case, but has been quite generally followed on some of the larger programs presently being installed.

In the case of existing machinery, most of the same procedure applies. However, there are certain differences which should be noted.

The need for very careful field surveys is indicated. Very often, compromises may be needed from the ideal conditions which could be obtained in order to keep production going or to keep costs down. Of course, these factors should all come out in the summary of all the factors needed to get a decision on the program as a whole.

ECONOMICS

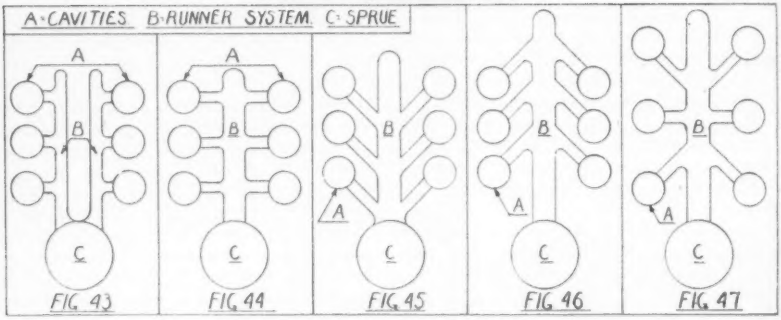
We have touched on this in our "**Development of An Automation System**", but feel that this item should be brought out and examined by itself because of the many questions which come up on the subject

I am certain that we all realize that economics is one of the most important

(Continued on page 66)

Die Casting Die Design

Part IV (Continued)



Figs. 43 through 47. A series of possible runner systems which might be employed to fill a six-cavity die casting die.

Runner Systems for Multiple Cavity Dies and Dies for Cold Chamber Machines

Whenever a multiple die is to be constructed for use on a cold chamber, horizontal type machine, and the part to be cast is of simple design not requiring the use of any movable side cores, the designer may lay out his cavities in any number of ways, viz., he may locate them in a circle about the sprue, or he may locate them all above the sprue opening. His choice will be governed by many factors such as: (a) the location of the injection chamber in relation to the center of the stationary platen of the machine on which the die is to be operated; (b) the thermal balance desired in the die; (c) the cost of die construction; and (d) the design of the part to be die cast.

Let us examine the manner in which a six-cavity die might be laid out and its runner system designed.

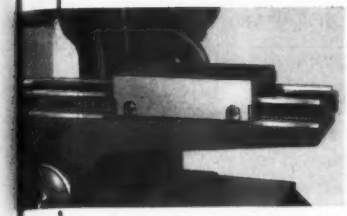
One way would be to locate all of the die cavities above the sprue and in two vertical rows of three each, Figures 43 through 47.

by **H. K. Barton**
and
James L. Erickson

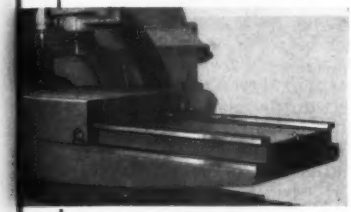
One common method for designing the runner system is shown in Figure 44. This method consists of a single straight vertical runner with six branch runners taking-off from the central main runner at 90° angles. When this design is employed, the single main runner should not possess equal cross-sectional area throughout its entire length, but should be somewhat reduced in cross-sectional area as each set of branch runners takes-off from it. Also, the branch runners should be of smaller cross-sectional area than the main vertical runner. The chief disadvantage of this method is the amount of turbulence it sets up in the stream of incoming molten alloy at those points where the branches take-off from the vertical runner. This turbulence tends to prevent the simultaneous filling of each of the six cavities, with the result that certain of the die cavities may be filled first and the metal therein begins to solidify before the applied pressure has come into full play.

In an attempt to avoid the turbulence just described, some designers have employed a modification of the single vertical runner with its branching runners set at an angle of 45° to it; this modification is shown in Figure 45. However,

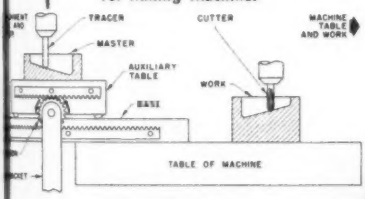
left-hand dies from right-hand masters . . and vice versa



Reverse Image Attachment for CINCINNATI 16" Vertical Hydro-Tel Milling Machine.



Reverse Image Attachment for CINCINNATI 28" Vertical Hydro-Tel Milling Machine.



Principle of operation, Reverse Image Attachment for CINCINNATI Hydro-Tel Type Milling Machines. The drawing is a view from the rear, showing the racks and gear to advantage.

Die for left-hand golf club reproduced from a right-hand master ...a typical setup with Reverse Image Attachment on a CINCINNATI 8" x 18" Tool and Die Miller.

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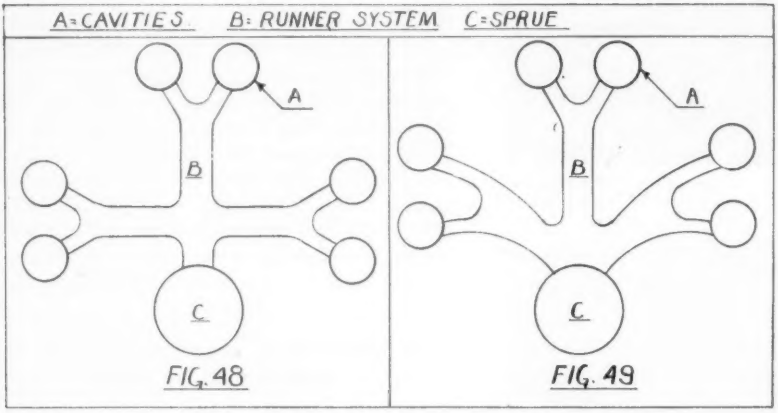
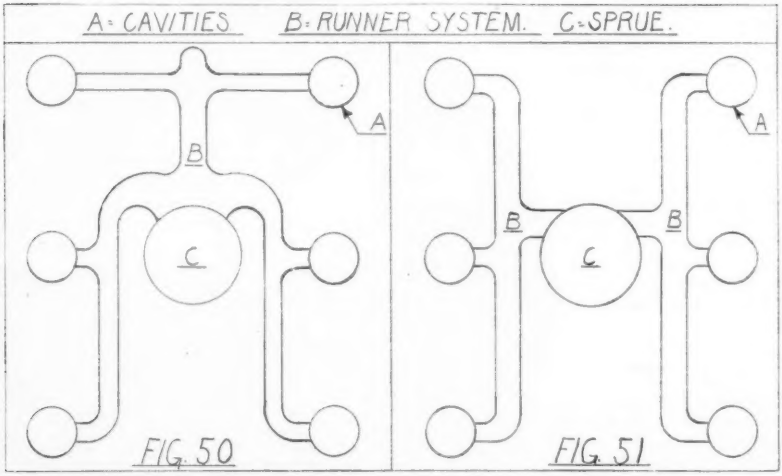
Figs. 48 and 49. Two designs possibilities for arranging die cavities above the sprue. Fig. 49 is preferable.



this modification, while minimizing turbulence somewhat, tends to accentuate rather than equalize the rates of die filling of the various die cavities; those die cavities nearest the sprue tending to fill last.

Another variation is that shown in Figure 46: here the individual branch runners take-off from the main runner in the downward rather than the upward direction. Those designers who employ this method claim, with some justification, that the entire runner system tends to fill uniformly before any molten metal rushes into any individual die cavity; however, the turbulence created is quite



Figs. 50 and 51. Possible arrangements of die cavities above the sprue when die is to be operated on a cold chamber, horizontal type machine.

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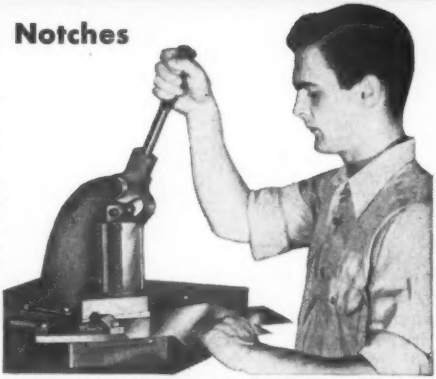

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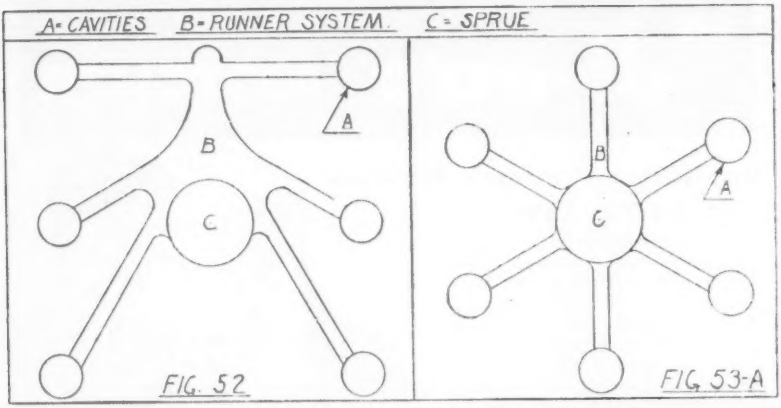
Fig. 52. Another possible arrangement of die cavities above the sprue when die is to be operated on a cold chamber, horizontal type machine. Fig. 53A. Runner for multiple cavity die leads directly from sprue when die is to be used on center shot, warm chamber machine.



considerable and most undesirable.

A still further variation is shown in Figure 47. Here the branches take-off at 45° upward for the top two die cavities, at 90° for the center two cavities and at 45° downward for the bottom two cavities.

Occasionally, a double type vertical runner system will be employed, Figure 43. The branch runners take-off from these two central runners.

When the die cavities are not located in straight-line position, one above the other in two vertical rows, as just described, but are grouped in pairs, an almost infinite variety of runner systems may be employed to get the incoming molten metal from the sprue to the individual die cavities. Two possibilities are shown in Fgures 48 and 49. Of these, that shown in Figure 49 is preferable.

When the die designer finds that he must design his multiple cavity die to operate on a cold chamber, horizontal type machine, which has its injection chamber located in the center of the stationary die platen, the die designer generally finds it necessary to position

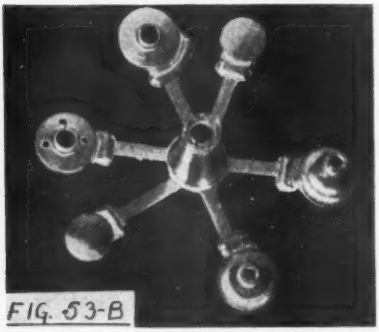


Fig. 53B. Die casting made with die whose runner leads directly from sprue.

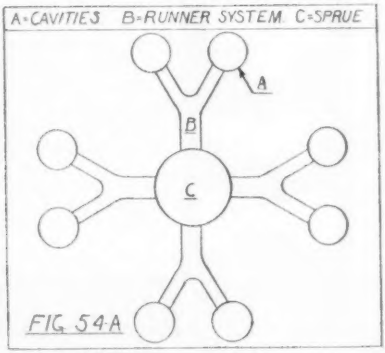


Fig. 54A. Runers are forked and branch off to feed two or more cavities.

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his die cavities about the sprue, as shown in Figures 50, 51, 52 and 53.

Dies for Center-Shot, Warm Chamber Type Machines

Almost without exception, the runners for multiple cavity dies for center-shot, warm chamber type machines are designed so that they lead directly from

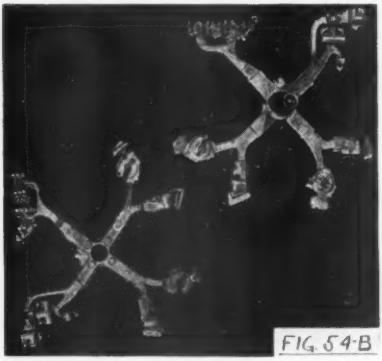


Fig. 54B. Castings made on a forked and branch runner die.

the sprue, at any angle, to the individual die cavities, Figures 53A and 53 B.

Frequently the runners are forked and branch off to feed two or more die cavities, Figures 54A and 54B.

Remarks on Runner Systems Design

It is the authors' opinion that almost any runner system can be made to function satisfactorily, provided that it:

(1) does not restrict the free flow of molten metal into any one die cavity more than any other;

(2) does not change direction abruptly, thereby creating a pressure drop, creating excessive and undesirable turbulence, and causing welding of the molten metal to the die;

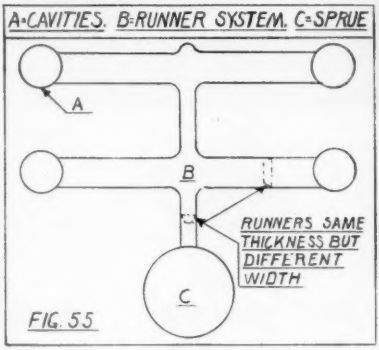
(3) does not change cross-sectional area sharply;

(4) is not so long that the incoming molten alloy passing through it cools too much before reaching the die cavity;

(5) does not cause local overheated area in the die; and

(6) does not increase in cross-sectional

Fig. 55. Incorrect runner design: The cross-sectional area of the runner branches is greater than the cross-sectional area of the main runner stem.



area as it approaches the die cavity or cavities, as shown in Figure 55.

A few facts to bear in mind when designing a runner or runner system are:

(a) A runner or runner system will fill up completely before any of the die cavities begins to fill provided (1) the thickness of the gates are uniform and less than 0.30" and (2) the excessive turbulence is not present within the runner system during the period of die-fill.

(b) The dynamics of molten metal flow is similar to hydrodynamics.

(c) Simultaneous or near simultaneous die filling of each cavity of a multipe cavity can be achieved by merely proportioning the cross-sectional area of the branch runners properly, provided feeds and gates are all uniformly proportioned.

(d) It is not necessary to vary gate size or thickness from cavity to cavity to achieve uniform die-fill of the individual cavities of a multiple cavity die.

Feed Design

The feed is that particular portion of the runner which decreases in depth as the runner approaches the die cavity and whose function is to choke off the flow of the incoming molten metal as it surges into the die cavity through the gate, as illustrated in Figure 56.

The cross-sectional area of a runner is always considerably larger than that of

(continued on page 100)

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AUTOMATION of Axle Housing Manufacture . . . from page 50

Some very unusual automation devices have been included in the producing of rear axle banjo type housings. This department has been processed to manufacture the complete unit starting with two 4½ inch diameter welded steel tubes, approximately 30 inches long.

The following series of pictures shows some of the high-lights of this department. Mr. Slattery picked out typical operations and arranged them in succession and also included some good views of the transfer type machines used for machining of the housing complete.

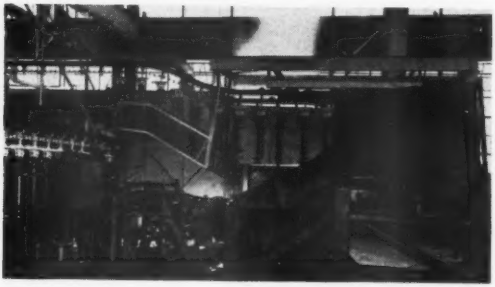
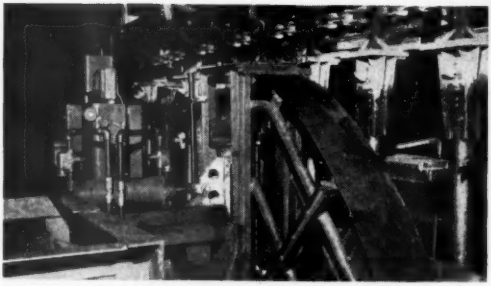


Fig. 1. This picture shows tote boxes at the right loaded with the 30" long x 4½" diameter tubes. A door is opened and the tubes roll by gravity to the conveyor shown. Loading of the overhead conveyor takes place automatically.

Fig. 2. This close-up shows the automatic loader which completes the loading shown in Fig. 1. The tube is rotated 180 degrees and loaded on the overhead conveyor with a push of the hydraulic cylinder. The overhead conveyor carries the part through washing, draw compound dip and dryer and to an automatic unloader for transfer to the first operation.



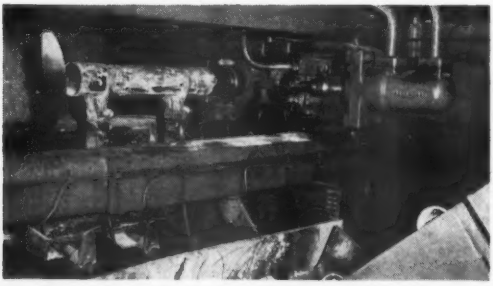


Fig. 3. This shows a tube reducing press with the automation arm holding the part in position. The tubes drop when the operation is complete and are carried to the next operation which performs another reduction operation and is not shown.

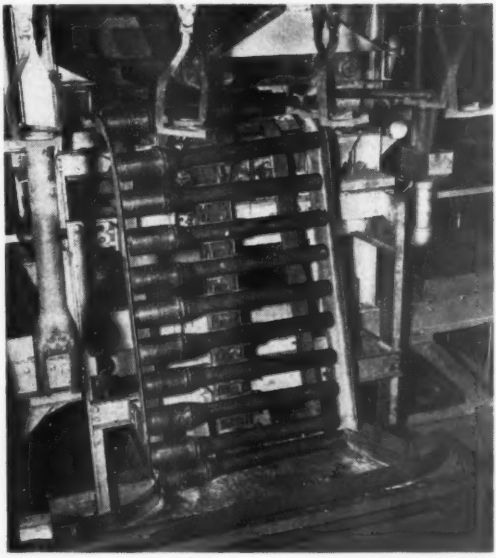


Fig. 4. At completion of the reduction work the part drops to a belt conveyor which delivers the part automatically to a conveyor feeder for delivery to a heating furnace.

Fig. 5. This view shows the exit end of the furnace which was loaded in Fig. 4. The chute shown handles the tube by gravity to the feed attachment of the upsetter. There is a pit under this machine for delivery to the next operation of heating before the second upsetter.

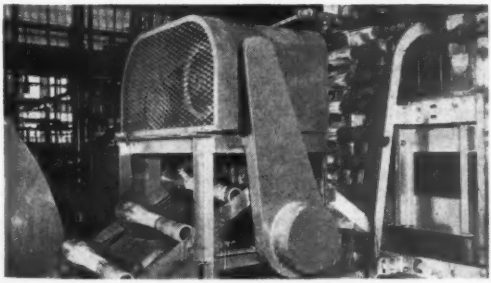


Fig. 6. Automatic loading of the second heating furnace can be seen. The operation at the second upsetter is similar to the first and is not shown. In the next few operations the large end is flattened, slit, stress relieved, washed and automatically dipped in draw compound.

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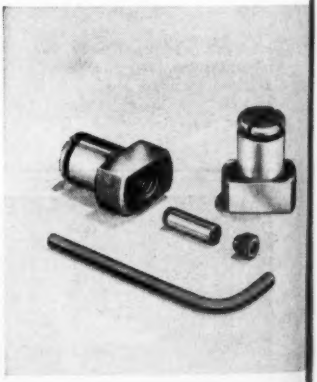

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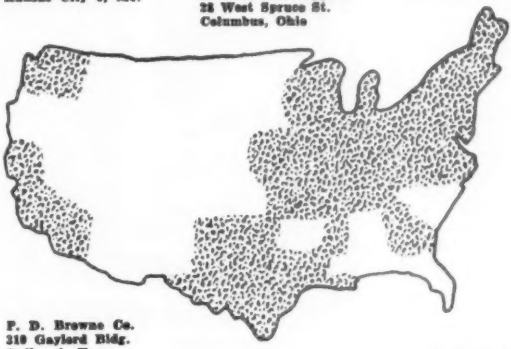

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Fig. 7. This unusual arrangement of presses is set up to produce the rounded end of the banjo face. The presses have a first form, second form, restrike, trim of ends, and trim of radius. The work is handled from the overhead conveyor delivering parts to the unit with an automatic transfer to the automation which can be seen in the center. The entire unit indexes, feeds the work into each press and holds it while the operation is being performed. One man operates the entire set-up.

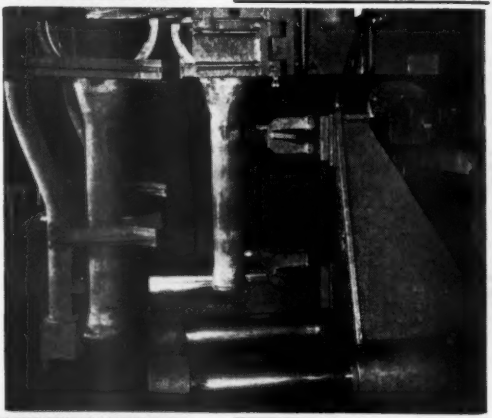

Fig. 8. This is a close-up view of the automation transfer which delivers the completed half of the axle housing to the over-head conveyor which passes through a washer and delivers to welding. The welding operations, shot blasting, water test and automatic panting are not shown.

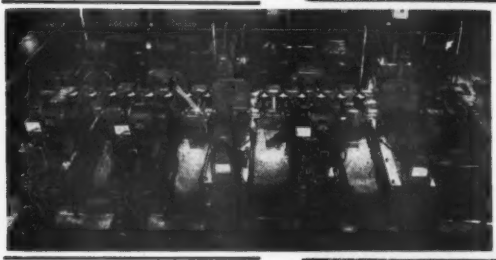

Fig. 9. A transfer machine roughs and semi-finishes the flanges of both ends. The transfer mechanism can be seen clearly between the stations. Absence of manual transfers is clearly indicated.

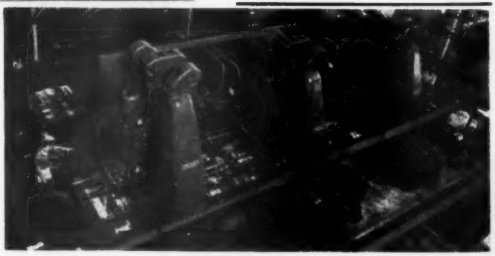

Fig. 10. Another transfer machine finishes the banjo face, drills and reams banjo and flange holes and finish bores the flanges. The axle housing is completely finished at this point, ready for assembly.

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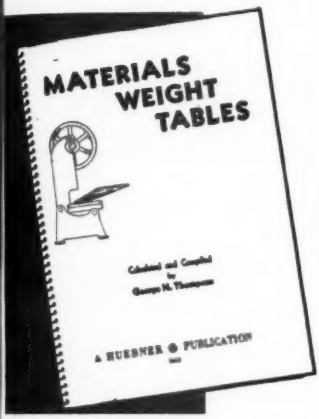

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. . . automation, from page 51

considerations in running any business. All expenditures must be examined for their value to the Company as a whole.

Automation expenditures are no different than any others and they must be expected to produce results in terms of increased production, lower costs, better working conditions or other benefits. The automation department has a responsibility to see that a true picture of the estimated costs, savings and all financial factors are brought out so that funds are not wasted on schemes which sound good or may be spectacular with very little benefit.

In the automobile industry this problem is especially significant since many of the parts manufactured are only utilized for one year. In cases of this kind, it is apparent that systems which do not pay for themselves in less than a model year are not economically advisable. In many cases such as press lines for body parts, machining lines for cylinder blocks, etc., longer amortization periods are permissible. The basic system can be used for several years with changes from year to year necessary only in the holding devices which are peculiar to the design of the part being produced at any given time.

When considering amortization periods, you will recall that we pointed out that in many cases correctly designed automation equipment is no more costly or only slightly higher than standard conveying devices which would be required for the job as a minimum. This consideration brings into sharp focus the need for an automation department to work on the new programs from their inception as we have outlined earlier.

As an example of this type of consideration, we would like to show the results of a study in one of the new Cylinder Block Departments which we are presently installing as part of our new facility programs.

The department under consideration is being set up to produce over 2,000 blocks in 16 hours. The machinery and equipment specified was all new and of the latest design with many of the new transfer machines included. The original development called for the utilization of roller conveyor throughout. The production capacity was such that the line was divided in several places as it split up from one machine per operation to two or three machines per operation and so forth.

For a roller conveyor system, this meant many large radius turns, powered sections and manual handling of parts for proper distribution of parts to the machine lines. Also, there were several places where it was necessary to turn the block over or to rotate it at 90° which resulted in manual operations. Practically all machine operators had to handle a part in some way.

The automation group studied this layout, using the method we have outlined earlier, and the results were very interesting from many standpoints. The layout which developed was more compact and ended up with a system of automation which was in a real sense an extension of much of the work which had been done by the machine tool builders as part of the machine. The labor required for handling of parts approached the vanishing point and the entire layout ended up as a synchronized continuous flow system in which it will not be necessary for any machine operator to push, pull, turn over or position a part.

Economically, the results were extremly worthwhile. Studies by our estimating group indicated that the well designed automation system would cost approximately 20% less than the original proposed system. The labor required to operate the department was reduced by one-third.

This example, we believe, points out the key to the entire program. If we want maximum economy of installation, and maximum savings of operation, start when the layout is in its early stages. Think of automation as you would a tool to do a given job of drilling, milling, or the like, required to produce a part as specified. The thought will be well worth your effort and keep your costs from getting out of line with your competitor.

(Continued next month)

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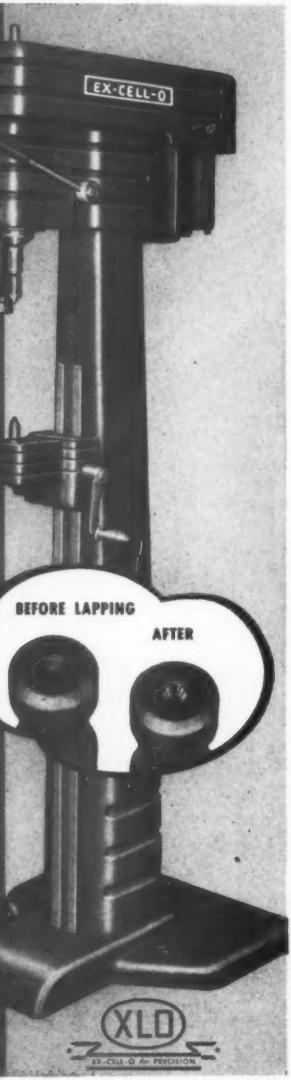

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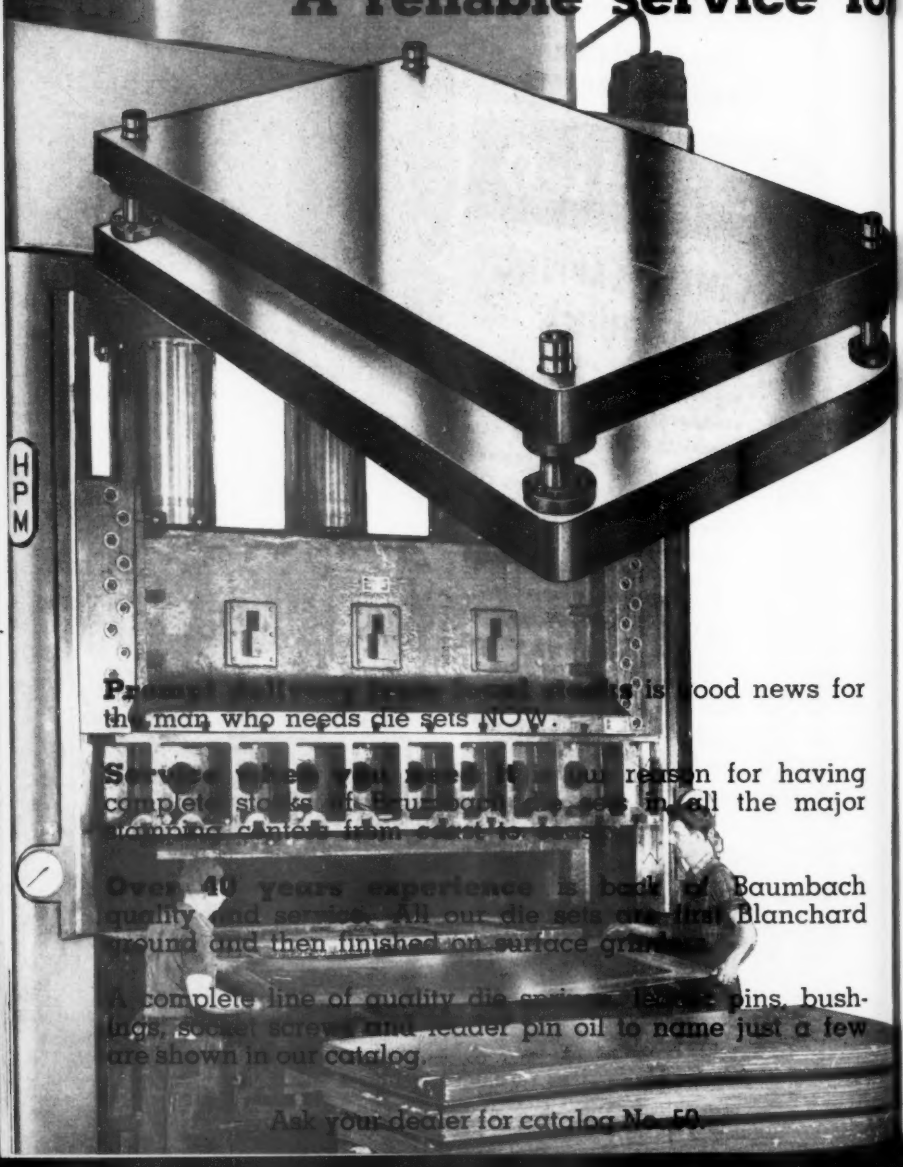

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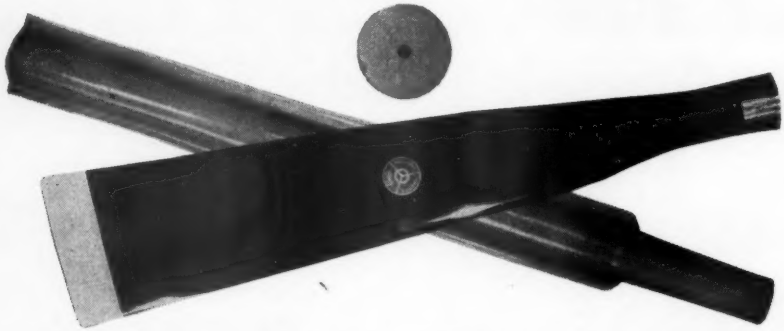


Materials—Manpower—Machining—Tools

Cooperation between the U. S. Air Force and the Propeller Division of the Curtiss-Wright Corporation has resulted in a new mass production method of hot extruding one-piece, hollow-steel propeller blades for high-speed combat and commercial aircraft.

Recognized as a vital contribution to the acceleration of the National Defense program, the new extrusion process makes possible spectacular savings in strategic materials, skilled manpower, costly machining operations, floor space required for manufacturing, and tools; all factors which will be of prime importance in the event of general mobilization requiring rapid increase of facilities and productive capacity. Operations in propeller manufacture, which now require hours of tedious hand work, are reduced by the new methods to a series of three steps which can be accomplished in minutes.

The successful development of the extruded propeller blade is the outgrowth of a research program undertaken by Curtiss-Wright under the sponsorship of the Manufacturing Methods Branch of

Fig. 1. For the first operation, which forms the shank of the finished propeller blade, the white-hot billet is inserted in the die container of the Loewy extrusion press. The press, rated at 5500 tons, is part of the equipment maintained by the Air Materiel Command at the Air Force Development Center, Adrian, Mich., where Curtiss-Wright developed this new process for producing propeller blades for high speed commercial and combat aircraft.

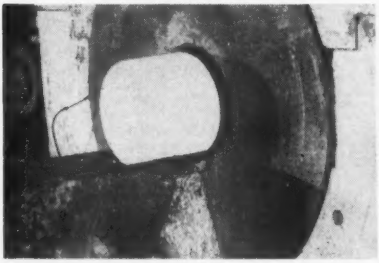
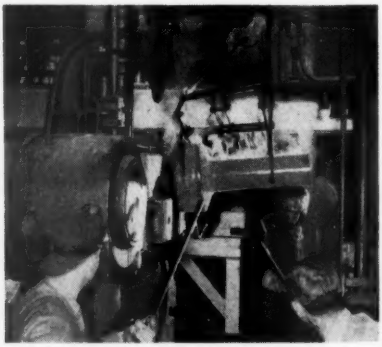


Fig. 2. Reheated after the first extrusion, the partially-formed steel billet is returned to the press for the second operation which expands and tapers the shank section in preparation for the final extrusion of the propeller blade tube.



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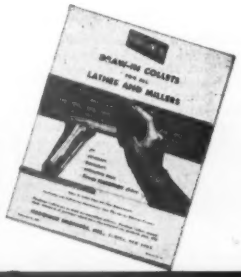

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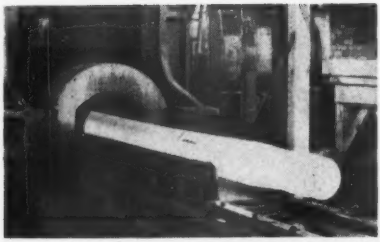


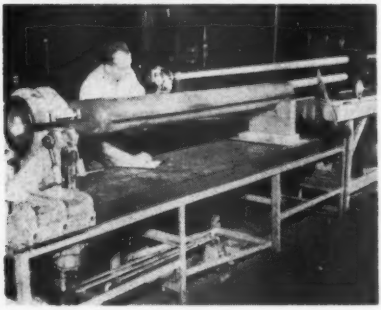
Fig. 3. Shank end first, the white-hot propeller blade tube emerges from the press after the third and final extrusion.

the Industrial Planning Division and the Propeller Laboratory of the Engineering Division, Air Material Command, at the Air Force Development Center, Adrian, Michigan.

The improved producibility of the extruded blade is accompanied by a marked increase in blade quality and strength-weight ratio. The tough, homogeneous structure of the extruded steel provides greater resistance to the more severe stresses to which propellers for higher horsepower piston and turbo-prop engines, now in production or being designed, will be subjected.

Curtiss-Wright reports that the extruded blade has progressed well beyond the experimental stage. Production for U. S. Air Force aircraft already has been initiated and plans are being made to

Fig. 4. The extruded steel tube is transformed into a Curtiss-Wright propeller blade by further heating and then flattening and forming within a die which gives it the proper twist and shape. Nitrogen, at a pressure of 1100 psi, provides internal support during this operation, which is commonly known as "blow-up."



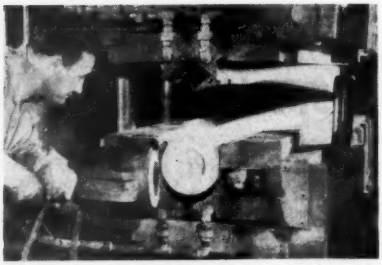


Fig. 5. Before the hollow-steel, extruded tube is further processed, it is mounted in this inspection fixture where the tapering wall thickness is measured to make certain that tolerances are fully met.

supplement welded types now being manufactured with extruded blades as rapidly as facilities become available.

While extrusion, the art of shaping metal in a continuous form by forcing it through a die, has been practiced by industry for over a quarter of a century, use of the basic process has been confined principally to the production of pipe, tubes, bars and other simplified forms except in the lighter and softer metals. When the Air Force—Curtiss-Wright research program was inaugurated, no recorded data were available on the hot extrusion of steel in anything approaching the complex shapes and tapered thickness required in propeller blade manufacture.

From this standing start, Curtiss-Wright and Air Force technicians perfected in less than two years the tech-

(continued on page 153)

Fig. 6. Rigid Magnaflux inspection of the internal and external surfaces follows the flattening and forming of the extruded steel tube into the shape of the final Curtiss-Wright propeller blade.

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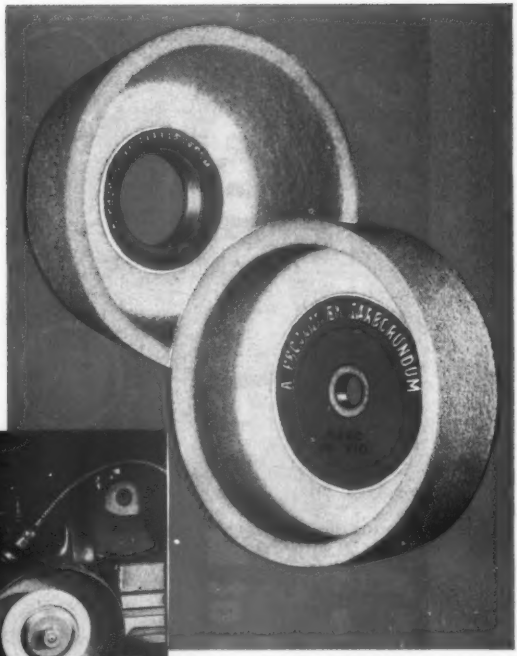

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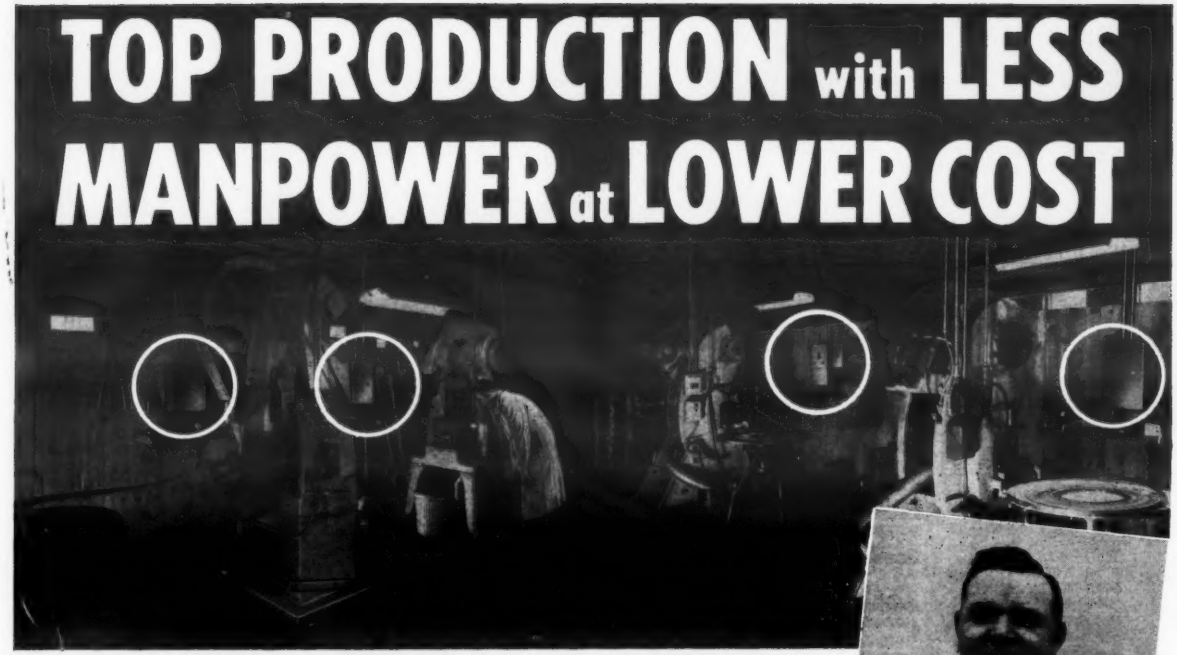

A view of four Protectron-equipped machines operating automatically with but one operator at the Parva Products Company, Mount Carmel, Connecticut, manufacturers of the famous Parva Patented Buckles for the brassiere, lingerie, shoe, suspender, belt buckle and other industries.

JOHN J. NOWICKI, PLANT MANAGER

JOHN NOWICKI,

Protectron has worked out very successfully for the Parva Products Company.

1. *One operator can run up to four machines*
2. Production efficiency has increased 22%.
3. Die breakage has decreased at least 86%.
4. Die life between grinds has increased

"Protectron has worked out very successfully for the Parva Products Company.

1. One operator can run up to four machines instead of one. In manpower saving alone, Protectron has paid for itself in less than seven weeks.
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3. Die breakage has decreased at least 86%.
4. Die life between grinds has increased 20%.

We consider Protectron one of our greatest production assets."

SEE ADVERTISERS INDEX, PAGE 118, FOR KEY NUMBERS

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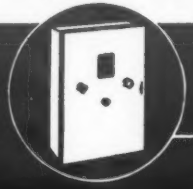

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GRANBY, CONN.

The Fifth Annual Convention of the American Society for Quality Control

will be held in the Public Auditorium, Cleveland, Ohio, Wednesday and Thursday, May 23-24, 1951. Convention Headquaters will be located at the Hotel Cleveland, and the Annual ASQC Banquet will be held there. However, all technical sessions and the Wednesday and Thursday luncheons will be held at the Public Auditorium.

Technical Program

The Technical Program for this Convention is one of unusually broad interest and scope. It provides a variety of timely topics and experienced speakers organized to challenge the interest and serve the needs of a wide range of audience acquaintance with the science and application of statistical quality control. It has been carefully planned to make available something of value to everyone, regardless of his level of maturity in this field.

Highlighting the program is the theme of Military Procurement Problems and Procedures, featuring the relationship of statistical quality control to Industry and the Armed Services in the current National Defense plans now taking shape. Statistical quality control will play a prominant role in this activity. Industrial leaders will have an opportunity at this Convention to hear high-ranking military authorities present their views on the importance of these techniques in military procurement matters.

The luncheon session at 12:15 p.m. on Thursday is planned to fit in with the Armed Service Procurement portion of the general Technical Program. The guest speaker at this session will be Admiral M. L. Ring, Director of Supply Management, Munitions Board, who has selected for his topic PROBLEMS IN MILITARY PROCUREMENT.

Other broad features of the Convention Program are set forth in the following general outline:

General Interest

The interest of some attendants at the Convention focuses in a specific content, but a much larger segment represent a variety of interests which can be serviced only by a program of broad scope. The presentations described in this section have been designed for the latter group.

Quality Control in Non-Metallic Fields. Broadly speaking, the interest centers in such operations as molding, drawing, shaping, baking, blowing, spinning, or weaving instead of metal machining. While it is not possible to cover completely such a diverse list, the presentations listed below contain typical factory control of rubber, glass and plastic operations.

QUALITY CONTROL IN TIRE MANUFACTURE. John K. MacKeigan, Chief Inspector, Dunlop Tire and Rubber Goods Co., Ltd., Toronto, Canada.

FINDING THE FACTS BEFORE SETTING THE SPECIFICATION. Julian H. Toulouse, Chief Engineer, Quality and Specifications Department, Owens-Illinois Glass Co., Toledo, Ohio.

TOLERANCE CORRECTIONS APPLIED TO PLASTICS FABRICATION. Edward B. Haden, Quality Control Director, The Esterbrook Pen Co., Camden, N. J.

Management's View of Quality Control. Many concerns are facing problems of fitting quality control into their own manufacturing operations. A distinct set of problems arise in dealing with vendors. Where both consumer and vendor practice quality control, complications are readily resolved, but where one practices quality control and the other does not, difficulties sometimes appear to be insoluble. Some light will be shed on these subjects by the presentations:

IMPROVING VENDOR-CONSUMER RELATIONSHIPS. Edward M. Schrock, Assistant to the Manager of Engineering, Household Refrigerator Div., Appliance and Merchandise Dept., General Electric Co., Erie, Pa.

ELIMINATION OF STEPS IN A PROCESS. Roscoe C. Byers, Quality Control Engineer, Headquarters Quality Control, Westinghouse Electric Corp., Pittsburgh, Pa.

QUALITY CONTROL ASSISTS PRODUCTION PLANNING. Eugene H. MacNiece, Director of Quality Control, Johnson & Johnson, New Brunswick, N. J.

The Use of Gaging Equipment in a Quality Control System. The analysis of a problem is wholly dependent upon the accuracy of the data employed. In most

(continued on page 78)

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. . . Quality Control, from page 76

applications the data arise from gaging operations, using either fixed or variable gages. Inspection and production departments will be interested in demonstrations of how to obtain accurate data for quality control through correct application of modern gaging equipment.

GAGING TO FIND THE FACTS. Francis B. Murphy, Assistant to the Chief Inspector, Hamilton Standard Div., United Aircraft Corp., East Hartford, Conn.

ESSENTIAL DESIGN QUALIFICATIONS AND CORRECT APPLICATION OF GAGING DEVICES NECESSARY FOR EFFECTIVE QUALITY CONTROL OF SCREW THREADS. Clinton V. Johnson, Partner, Johnson Gage Co., Bloomfield, Conn.

THE APPLICATION OF AIR, ELECTRONIC AND AUTOMATIC GAGES TO CONTROL QUALITY. W. Fay Aller, Director of Research, The Sheffield Corp., Dayton, Ohio.

How to Organize and Install a Quality Control System. Perhaps the criticism most commonly leveled at quality control managers is failure to set a correct objective for their work and organize their departments to attain that objective. Often internal circumstances in a plant prevent attainment of a properly planned goal. Likewise, many plants are now investigating the advantages of quality control. The management of these concerns and most others that now have quality control installations can profit from the penetrating and experienced analyses of this subject listed.

INSTALLING A QUALITY CONTROL SYSTEM. Joseph M. Juran, Chairman, Dept. of Administrative Engineering, New York University, New York, N. Y.

INSTALLING STATISTICAL QUALITY CONTROL IN A PHARMACEUTICAL MANUFACTURING COMPANY. John K. Taggert, Head, Inspection Depts., Eli Lilly and Co., Indianapolis, Ind.

Visual Aids to Presenting Quality Control in the Factory. Closely allied to the preceding presentation is the question: How can the operating technique of quality control be set forth understandably for foremen and operators on the one hand and for top management on the other? Neither of these groups can be expected to include statistical proficiency in the training for their jobs. Yet a successful quality control installation requires that both possess a considerable familiarity with the statistical approach to problems. The accumulation of a vast amount of experience indicates that "one picture is better than a thousand words." The visual aids which will be presented are simple, efficient and universally instructive.

MECHANICAL AIDS FOR PRESENTING THE QUALITY CONTROL STORY. Robert E. Wagenhals, Director of Quality Control, The Timken Roller Bearing Co., Canton, Ohio. assisted by Lewis D. Rice, Quality Control Engineer, The Timken Roller Bearing Co., Canton, Ohio.

A SHOP DEMONSTRATION OF QUALITY CONTROL PRINCIPLE AND PRACTICE. Wendell H. Abbot, Supervisor, Statistical Section, Lamp Dept., General Electric Co., Nela Park, Cleveland, Ohio.

Educational Program

Perhaps it would be safe to assume that at some future date the practice of quality control in industry will be so universal that each concern will have established a training program for replacement and expansion of its quality control staff. In the forseeable future, however, the acceptance of quality control by additional concerns and the expansion of existing installations present a virtual mandate to the Society to maintain an elementary training program as an integral part of its Convention Technical Program.

This program is planned so as to provide about ten hours of unified instruction carefully planned so as to blend principles and shop practice while keeping uppermost that trainees will come from many different fields of manufacture and will be a mixture of beginners and those seeking a refresher. The course will include the management of data, types of control charts and their interpretation and principles. Factory problems to illustrate techniques will be presented and solved by the students during the class periods. The instructors are Arthur Bender and George McDermott, Engineering Dept., Delco-Remy Div., General Motors Corp., Anderson, Ind.

Special Note: The Educational Program will start at 9:00 a.m. Wednesday, May 23. All persons expecting to enroll should make their travel arrangements so as to be present at the opening session which will contain introductory material that, because of the limited time, cannot be repeated in subsequent sessions. This session will recess, however, in time for trainees to attend the General Assembly at 11:00 a.m.

Armed Services Procurement

The defense program now in process of activation presents problems to industrial management that in some respects

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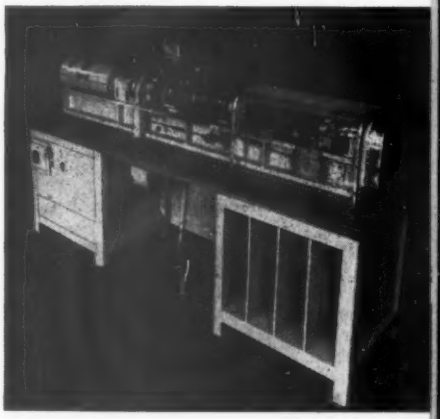

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dwarf those of 1941. An important offset to the situation is the unification of procurement by the Armed Services. The advantages accrue to both the government procurement agency and contractors for materiel, in that procurement policy at top levels can be established and maintained from the inception of the program, and a single acceptance plan can be universally applied and uniformly administered.

This program has been set up to bring to top management, quality control management and quality control operators the policy and acceptance practice of the Armed Services. The program will be staffed by representatives of Armed Services procurement agencies from the three major services.

THE QUALITY EVALUATION POLICY OF THE AIR MATERIEL COMMAND. Brig. Gen. Walter G. Bain, USAF, Quality Control Div., Wright-Patterson Air Force Base, Dayton, Ohio.

THE ARMY'S PROGRAM FOR QUALITY CONTROL. Lt. Col. C. E. Capito, Department of Defense, General Staff, United States Army.

THE NAVY'S PROGRAM FOR QUALITY CONTROL. Captain M. R. Williams, Field Services Div., Office of Naval Materiel, Navy Department.

MILITARY STANDARD 105-A—A STANDARD INSPECTION SYSTEM. Commander B. L. Lubelsky, U.S.N., Assistant Director of Quality Control Div., Bureau of Ordance, Department of the Navy, and William R. Pabst, Jr., Assistant for Statistics, Quality Control Div., Bureau of Ordnance, Department of the Navy.

Allied with the preceding is a program presenting currently used methods in acceptance sampling.

APPLICATIONS OF SEQUENTIAL SAMPLING IN RECEIVING INSPECTION. Edward R. Close, Chief Inspector, Instrument Div., Bausch & Lomb Optical Co.

RECENT LOT PLOT EXPERIENCES AROUND THE COUNTRY. Dorian Shainin, Chief Inspector, Hamilton Standard Div., United Aircraft Corp., Hartford, Conn.

ACCEPTANCE INSPECTION OF PURCHASED MATERIALS. E. G. D. Paterson, Systems Quality Engineer, Bell Telephone Laboratories, Inc., and J. E. Palmer, Superintendent, Supplies Inspection, Western Electric Co., Inc., New York, N. Y.

Mathematical Statistics

The foundations of quality control are in the work of the statistician. Yet the quality control operator is largely unable to read and understand the voluminous literature which is made available by the statistician. The speakers in this session will present some of the services of statistics to quality control in a form which will remove the mystery and stress the utility.

TWO SIGMA OR THREE SIGMA. Harold A. Freeman, Professor of Statistics, Massachusetts Institute of Technology, Cambridge, Mass.

QUICK AND DIRTY METHODS IN STATISTICS—Part 1. W. Allen Wallis, Professor of Statistics, The University of Chicago, Chicago, Ill.

QUICK AND DIRTY METHODS IN STATISTICS—Part 2. John W. Tukey, Professor of Mathematics, Princeton University, Princeton, N. J.

Metal Producing and Fabricating Industries

Furnacing operations in the iron and steel industry were marked early as a difficult place in which to introduce the statistical approach. Likewise, foundry men have often claimed that their operation defies statistical science. In contrast, intermediate machining operations have been the very core of quality control application. The speakers listed below are prepared to present the story of quality control application in furnacing, in the foundry and in intermediate machining.

PRACTICAL CONSIDERATIONS IN THE APPLICATION OF STATISTICAL TECHNIQUES IN STEEL PROCESSING. John V. Sturtevant, Development Metallurgist, Irvin Works, U. S. Steel Corp., Pittsburgh, Pa.

ANALYZING OPEN HEARTH DATA—STATISTICS VS. OPINION. Donald S. Leckie, Quality Control Engineer, Republic Steel Corp., Cleveland, Ohio.

QUALITY CONTROL AT WORK IN THE STEEL FOUNDRY. Harold H. Johnson, Metallurgist, National Malleable and Steel Castings Co., Sharon, Pa.

TYPICAL QUALITY CONTROL APPLICATIONS AT DELCO PRODUCTS. Leo J. Nartker, Superintendent, Quality Control Section, Delco Products, Dayton, Ohio.

PEOPLE, PISTON RINGS AND QUALITY CONTROL. Carl E. Hoover, Quality Control Administrator, Perfect Circle Corp., Hagerstown, Ind.

USING THE NORMAL CURVE IN PRESENTING INFORMATION TO SUPPLIERS AND DESIGN ENGINEERS. Louis K. Vollenwedder, Assistant Chief Inspector, John Deere Waterloo Tractor Works, Waterloo, Iowa.

THE APPLICATION OF QUALITY CONTROL IN THE MALLEABLE FOUNDRY. Edwin F. Prince, Engineer, The Dayton Malleable Iron Co., Ironton, Ohio, assisted by F. S. Gibson and O. K. Hunsaker.

APPLICATIONS OF QUALITY CONTROL IN THE ALUMINUM INDUSTRY. William P. Goepfert, Staff Metallurgist, Aluminum Co. of America, Pittsburgh, Pa.

The Technical Committees

The programs which follow have been set up by the Technical Committees to meet the needs of Convention participants from these industries.

The Chemical Industries. The control of chemical processing offers the maximum challenge to the ingenuity and technical knowledge of the statistician.

(continued on page 82)

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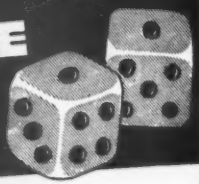

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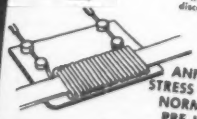

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. . . Quality Control, from page 80

Research and development pose problems in design and anlysis. Within the broad field of the chemical industries, pharmaceutical manufacture is a major segment. This segment in addition to the usual complications of chemical manufacture must maintain sterile conditions in production areas and controls which are partially dictated by the Federal Food and Drug Administration.

All of these presentations will presuppose some familiarity with the statistical approach to problems. The applications, although geared to the chemical industry, will be generally instructive. The last two presentations have been set up specifically to present to representatives of the pharmaceutical industry an available approach to compounding and filling problems.

THE INTERPRETATION OF CHEMICAL DATA. William J. Youden, Assistant Chief, Statistical Engineering Laboratory, National Bureau of Standards, U. S. Department of Commerce.

SOME EXAMPLES OF THE USE OF THE ANALYSIS OF VARIANCE IN INTERPRETING CHEMICAL DATA FROM THE LABORATORY, THE PILOT PLANT AND THE PRODUCTION PROCESS. K. Alexander Brownlee, Biometrician, Squibb Institute for Medical Research, New Brunswick, N. J.

SOME RAPID APPROXIMATE STATISTICAL PROCEDURES. Frank Wilcoxon, Statistician, Lederle Laboratories Div., American Cyanamid Co., Pearl River, N. Y.

STATISTICAL QUALITY CONTROL'S IN MAKING BETTER MEDICINES AT ELI LILLY AND COMPANY. Ralph Ernsberger, Chief, Statistical Inspection Dept., Eli Lilly and Co., Indianapolis, Ind.

REDUCING THE EFFECT OF PROCESS AND TESTING VARIABILITIES. Robert M. Hofstead, Assistant to the Director of Statistics, Bristol Laboratories, Syracuse, N. Y.

The Electronics Industry. Establishment of the Electronics Technical Committee within the American Society of Quality Control is the best evidence of the wide-spread interest in quality control in this expanding industry. The Committee has set up an initial session on Wednesday afternoon and a related one on Thursday afternoon to develop the facets of the major problems of dealings between raw material and subassembly producers on one hand and assembled product producers on the other. At the Wednesday session representatives of vendors and consumers will present their problems and points of view. It is expected that these presenta-

(continued on page 85)

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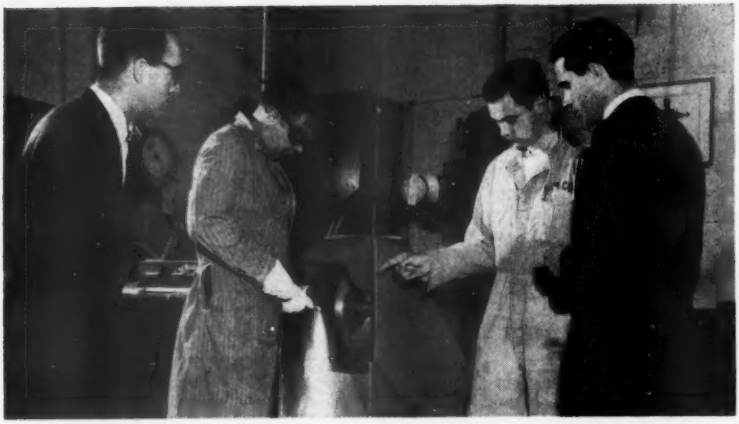
REAMING... Showing hole in large template being reamed by simply interchanging the drill and bushing with corresponding size reamer and reamer bushing.



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Come in anytime with any kind of problem—from heavy grinding to fine finishing. Chances are we can assist you. 3M Demonstration Rooms: Boston, Chicago, Cincinnati, Cleveland, Detroit, Grand Rapids, Los Angeles, New York, Philadelphia, St. Louis, St. Paul, San Francisco, and Seattle. Send the coupon below for further information.

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Made in U.S.A. by MINNESOTA MINING & MFG. CO., St. Paul 6, Minn., also makers of "Scotch" Brand Pressure-sensitive Tapes, "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-Slip Surfacing, "3M" Adhesives. General Export: Durex Abrasives Corp., New Rochelle, N. Y. In Canada: Canadian Durex Abrasives Ltd., Brantford, Ontario.

. . . Quality Control, from page 82

tions will generate discussion and questions which will be brought up in the Thursday session in which the speakers of the Wednesday session will sit as a panel to focus questions and discussion from the floor. It is expected that the meat of the Thursday session will come from those in attendance. Thus, a general airing of the problems of vendors and consumers in dealing with each other can lead to better understanding and better relations.

QUALITY EVALUATION OF GENERAL ELECTRIC COMPANY'S ARING TUBES. J. Alfred Davies, Supervisor of Statistical Control Methods, Receiving Tube Div., General Electric Co., Owensboro, Ky.

DEALING WITH LARGE AND SMALL SUPPLIERS. John T. Clark, Production Control Engineer, Sentinel Radio Corp., Evanston, Ill.

THE PUZZLE IN VENDOR-CONSUMER RELATIONSHIPS. Robert J. Miller, Supervisor of Electronics Quality Control, Erie Resistor Corp., Erie, Pa.

CONSUMER-VENDOR PROBLEMS IN CONVERTING TO MILITARY PRODUCTION. Paul Fritschel, Manager of Technical Service, Commercial Equipment Div., Electronics Dept., General Electric Co., Syracuse, N. Y.

VENDOR QUALITY IS A CONSUMER RESPONSIBILITY. Leo J. Jacobson, Manager, Quality Control Dept., International Resistance Co., Philadelphia, Pa.

STANDARDS VS. PERFORMANCE OF SUPPLIERS. Alfred J. Winterhalter, Jr., Assistant Manager of Quality Control, Colonial Radio Corp., Buffalo, N. Y.

The Automotive Industry. The manufacture of parts and subassemblies in the automobile industry is one of the largest fields in American production. Here the transfer of precision from the toolmaker level to the production level is complete. The automobile assembly line is an outstanding example of the American manufacturing system. Quality control of this stage of production has been expanded greatly in recent years. The applications which will be presented have been planned to attract all quality control men who are involved in control problems of precision machining or progressive assembly.

THE USE OF STATISTICAL TECHNIQUES FOR INVESTIGATION PURPOSES. Carl V. Garrett, Assistant Chief Inspector, Allison Div., General Motors Corp., Indianapolis, Ind.

BUILDING QUALITY CONTROL. Kenneth Rosengren, Quality Manager, Houdaille-Hershey Corp., Houde Engineering Div., Buffalo, N. Y.

QUALITY CONTROL AS A METHODS IMPROVEMENT FUNCTION IN AUTOMOTIVE AND AIRCRAFT PARTS MANUFACTURING. Emil F. Gibian, Chief Industrial Engineer, Thompson Products, Inc., Cleveland, Ohio.

PROBLEMS OF RECEIVING INSPECTION AND THE ASSEMBLY LINE. William H. Smith, Manager, Analysis Dept., Quality Control—Manufacturing Staff, Ford Motor Co., Dearborn, Mich.

QUALITY CONTROL IN THE ASSEMBLY OF THE JEEP. Nelson G. Meagley, Manager, Statistical Control, Willys-Overland Motors, Inc., Toledo, Ohio.

AUXILIARY PROGRAM FEATURES

Transactions. Bound volumes of the technical proceedings will be available at the Convention, thus providing a permanent record for future reference and study.

Exhibits. This convention promises to offer visitors more exhibits than have thus far been shown at any ASQC Convention. Many new and interesting types of exhibits will be presented, featuring a broad scope of instrumentation in the SQC field. Large background murals, quality control at work and practical demonstrations of equipment are among the items planned to make these exhibits a vital addition to the general program and a valuable educational aspect of the Convention.

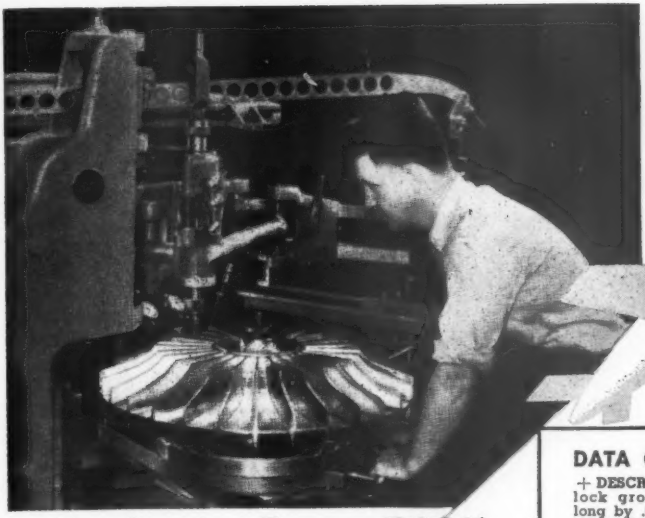
On the next page will be found the list of exhibitors, complete up to time of going to press. The notes on what each exhibitor will be displaying or demonstrating give a good idea of the extent and diversity of the educational value of the collective displays. The exhibits will be manned by personnel experienced in the techniques featured.

Book Stall. A collection of books representing a comprehensive cross section of typical SQC literature will be maintained as a service for visitors to the Convention. Competent technical advisers will be present to discuss questions relating to the textbook field. Purchases may be made or orders placed at the Book Stall, and a "Meet the Author" feature has been arranged so that purchasers desiring to do so may have some of these books autographed by their respective authors.

SEE NEXT PAGE FOR LIST OF EXHIBITORS AND FEATURES

ASQC 5th Annual CONVENTION., Cleveland, May 23-24, 1951.

Exhibitor	Featuring	Booth
AM. SOC. for QUALITY CONTROL	Advantages of Membership	33-34
Bausch & Lomb Optical Co.	Optical Aides to Inspection	27
Berrettoni & Associates	Case Histories	38
Book Display—ASQC	QC Books & Devices	6-7
Brown & Sharpe Mfg. Co.	Electronic Gages & Prec. Tools	30
Brush Development Co.	Faxfilm Comparator	25
Cadillac Gage Co.	Quick-gaging Devices	51
Cleveland Graphite Bronze Co.	Brg. Liner & Bushing Gaging Equip.	63
Coca-Cola Co.	QC Results with Samples	57-58
DoAll Company	Prec. Gage Blocks & Equip.	18
Elliott Service Co., Inc.	Quality Promotion Aids & Services	44
Engineer's Specialties Div.	Optical Comparators	61
Engis Equipment Co.	Optical Insp. Devices	48
Federal Products Corp.	QC Projects Promoted by Federal QC at Work	20
Ford Motor Co.		31-32-35-36
Friden Calculating Machine Co., Inc.	Calc. Mach. in QC Analysis	3
General Electric Co.	QC Indicators	1
Goodyear Tire & Rubber Co.	Tire Mfg. in Miniature	52-53
Graham-Mintell Inst. Co.	Electronic Gages	5
Greenfield Tap & Die Co.	Prec. Gaging Equip.	8
Johnson Gage Co.	Thd. Comparators & Applications	26
Jones & Lamson Machine Co.	Optical Comparators & Charts	47
King-Seeley Co.	Sub-assemblies & Control Charts	59
Lamson & Sessions Co.	QC Results	29
Magnaflux Corp.	Non-destructive Testing & QC	62
Monroe Calculating Machine Co.	"Squarmatic" Monroe Calculator	11-12
National Tool Co.	Pocket Comparator	56
Ohio Rubber Company	QC Charting Applications	16
Physicists Research Co.	Profilometer Equip.	21-22
Pratt & Whitney Div.	Prec. Insp. Equip.	13-14
Sheffield Corp.	Prec. Gaging & Case Histories	38-40
Starrett Co., L.S.	Prec. Measuring Tools & Indicators	37
Taft-Peirce Mfg. Co.	Prec. Gaging Equip.	50
Thompson Products, Inc.	Jet Engines & QC	23-24
Webber Gage Co.	Prec. Gage Blocks & Angle Blocks	41½
Willys-Overland Motors, Inc.	QC as Applied to the "Jeep"	45-46
Wollensak Optical Co.	High Speed Cameras	28



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Production Zooms 500%
on Aircraft Engine Parts

With Gorton pantographs and die and mold duplicators, you increase production, lower costs and do more accurate profiling, routing, die sinking, mold cutting, counterboring, chamfering, grooving, graduating or engraving. These machines are indispensable on many jobs involving either commercial products or materiel for the armed forces.

You can machine ferrous, non-ferrous or plastic materials . . . in *work shape* that's flat, uniformly curved, cylindrical, spherical or irregular . . . in *work size* varying from dime-size parts to areas as large as 10 by 20 feet.

Repetitive accuracy, a dozen or a thousand pieces, is yours with *enlarged* masters that give you advantages of the reduction ratio — an *exclusive* pantograph characteristic. You can depend on fast cutting and high surface finish from high-speed steel or carbide cutters and burrs in a wide range of spindle speeds up to 45,000 R.P.M.

DATA ON THIS JOB

+ **DESCRIPTION:** Mill 58 key lock grooves 2.360"-2.460" long by .076"-.080" wide by .028"-.030" deep in edges of compressor impeller blades. Material is heat treated aluminum alloy forging; hardness — 120 Brinnell. Size, 28.800" dia., by 7⅝" thick.

+ **HOLDING FIXTURE:** Special; arranged for manual indexing and incorporating opposed dial indicators for positioning each blade.

+ **MASTER:** 3-dimensional, semi-automatic; pneumatically operated; enlarged 5 times.

+ **CUTTER:** 2-flute ball nose solid carbide, running at 10,500 R.P.M. Feed, 5.9" per minute with coolant. Depth of cut, .030"; width, .080".

+ **MACHINE:** Standard Gorton 3-L 3-dimensional pantograph with special tooling.

Results: **Floor-to-floor time, after set-up, is 58 minutes. Previous method took 5 hours.**

Mail coupon or write for copy of the Gorton General Catalog — no obligation.

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Please send at once complete information about the Gorton line contained in Bulletin 1655-1205

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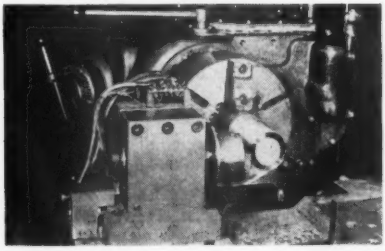
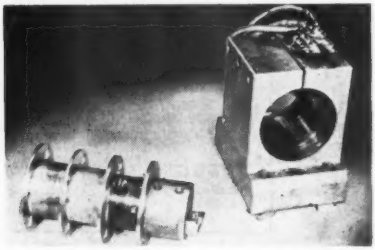
SEE ADVERTISERS INDEX, PAGE 119, FOR KEY NUMBERS

Carbide High-Velocity Turning

Measurement of the components of tool loads on a lathe was among the problems solved by engineers of Jones & Lamson Machine Company in preparation for a broad research program on "carbide high-velocity turning." The methods used and results of this work were reported recently by Leif Fersing, experimental engineer, at the annual meeting of the American Society of Mechanical Engineers.



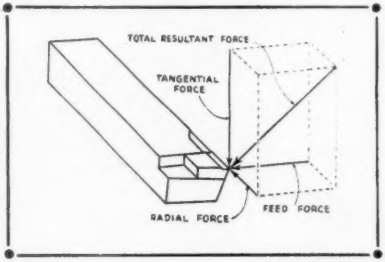
Solution of this problem was based on utilization of resistance wire strain gages which were bonded to a special tool holder and small cantilever beam in such a way as to enable determination of radial, tangential and feed forces. These strain gages (products of Baldwin-Lima-Hamilton Corp.) are essentially tiny grids of hair wire which, when bonded to a strained member, are strained with the member, thus changing their electrical resistance by measureable amounts. Development of a special tool holder for measuring these components required designing for rigidity without loss of sensitivity and accuracy. This was provided by means of a massive tool post having a round hole in which the special tool holder was clamped.



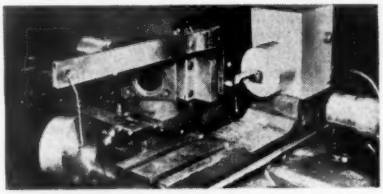
The tool post and tool holder designed for this test are shown above mounted on a turret lathe. Bunch blocks for wiring connections between gages and recorders are shown on top of the massive tool post.

The tool holder was machined from a solid piece of steel, the flanged length being bored and turned to a tubular section. A square hole was provided in the solid end to receive 1" x 1" tools and it was located so that the cutting edge of the tool could be kept on the axis of the holder. This location minimized errors from torque interference with components of tool loads. An end plate was pressed into the rear end of the holder and fitted with a steel ball in its center for contact with the cantilever beam.

Photos courtesy Baldwin-Lima-Hamilton Corp., Philadelphia, Pa.



Two sets of strain gages were cemented to the holder behind the flange nearest the cutting edge. This flange, outside of the tool post, served as a guard for four of the gages. The tangential load on the tool was measured by two gages on top and bottom of the holder and the feed load by two gages placed on the sides of the holder. The tool holder with gages cemented in place and the tool post are shown at lower left. The radial or shank load was



indicated by a set of gages on the cantilever supported at the rear end of the tool post at right angles with the axis of the tool holder.

The upper end of the cantilever was in contact with the ball at the rear of the holder and was slightly preloaded in order to assure good contact. The location of the ball was chosen so that bending loads on the toolholder would have minimum effect on radial tool loads.

The three sets of strain gages on the toolholder were connected to universal analyzers and direct-inking oscillographs, which made simultaneous records.

Gage wires are connected to recorder wiring through bunch blocks on top of the tool post.

The diagram at the top illustrates the total resultant force exerted by the tangential force, the radial force and the feed measured by the strain gages.

Calibration of instruments was made with known loads, shown above, applied in the direction of tool load components. Steel cover for tool post, tool holder and strain gages are shown in place.

.0001" in six inches

GUARANTEE

The Rivett 608 will turn or bore within 0.0001" in six inches work held in collet, and turn between centers within 0.0001" in six inches. The Rivett 608 will face to eight inches diameter within a limit of 0.0002" concave, 0.0000" convex. The Rivett 608 will cut threads within 0.0005" in twelve inches, or within 0.0003" in any three inches, or within 0.0002" in any inch of a specimen piece.

PLUS every known attachment

A symbol of extreme accuracy, this Rivett 608 lathe is used in nearly every instrument and tool shop where fine exacting work is performed. A greater number of mechanical marvels have been developed on this lathe than on all other machine tools combined. The 608 is a small but exceedingly powerful back-geared, screw cutting engine lathe, with slide areas equal to those of other lathes twice its size. Finely-made attachments are available for milling, spiral-cutting, slotting, relieving, taper turning, radius turning, grinding, and forming. Write for Bulletin 608F.

RIVETT LATHE & GRINDER, Inc.

Dept. TDJR-5, Brighton 35, Boston, Mass.

For More Precision Work *RELY ON RIVETT LATHES AND GRINDERS*, The Master Craftsman's Master Tools

SEE ADVERTISERS INDEX, PAGE 119, FOR KEY NUMBERS

Here's How . . . to Demonstrate the Effectiveness of Quality Control Charts

"What can one of these quality control charts do for me?" asks Joe Dun, foreman of a department. Most foremen are not easy to convince of the advantages of management's new tool when you just sit down and talk about it. Why? Because, as we have heard many times, "I don't need high-powered mathematics to run my department." This first impression can be nullified by using a visual aid in showing just how a control chart will indicate when a machine needs adjustment or repair.

by **R. E. Wagenhals**
Director of Quality Control
Timken Roller Bearing Company
Canton, Ohio

The small, portable demonstrator pictured here has been very successful in showing the effectiveness of a quality control chart. It is patterned basically after an old museum and university curiosity known as the "Statistical Quincunx" invented by Sir Francis Galton in the latter part of the 19th century. The name "Quincunx," as the demonstrator is often called, is derived from Latin meaning "five ounce." The five-ounce weight was marked by four dots at the corners of a square and a fifth in the center. This mark is commonly used on dominoes and dice and is repeated many times in the arrangement of the pins of the demonstrator.

By the use of this device, the natural law of probability and the principles of quality control charts can be demonstrated more quickly and effectively than by other more laborious and time-consuming methods.

The demonstrator is 9 ¾" x 14" x 1 ⅝", weighs 7½ pounds and is of aluminum construction. A small spirit level on the back checks plumbness and a hinged easel holds the device in the proper position.

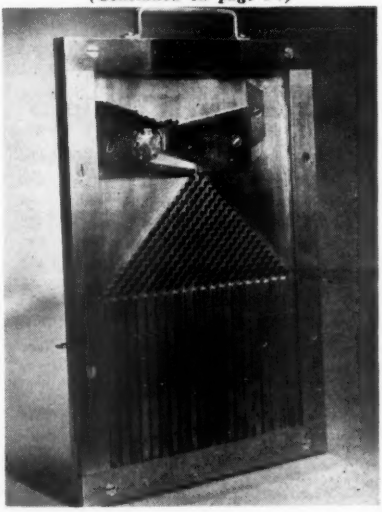
The 300 one-eighth inch steel balls, blackened by "Black Magic," can be released rapidly or slowly as desired by the manual rotation of the notched wheel.

After passing through the maze of fiber pins, the balls drop into slots and build up a frequency distribution which is a good approximation of the "Normal Curve."

When performing a control chart demonstration, we have found it effective to hide the space below the pull wire with a piece of carboard or paper.

The balls are dropped one at a time, in order that no two will touch each other while in the maze of pins. After five have come to rest upon the rod, the average and the range are plotted as shown on the control chart illustration.

(Continued on page 94)



The "Quincunx" gives a visual demonstration of the law of probability which underlies the practices of Statistical Quality Control.

Central Read-Rite Micrometer reads at a glance—without complicated arithmetic. It's easy to handle, easy to work, and—with its built-in "adding machine"—*easy to read.* Even unskilled workers can read the true *Certified Accuracy* measurement *right* every time.

The Read-Rite is available in two polished frame models, 0 to 1" (illustrated) and 1" to 2", and six black enameled frame models with a combined range of 0 to 6".

This Micrometer reads at a glance.

THE CENTRAL TOOL COMPANY
CRANSTON 10, R. I., U. S. A.

Gentlemen: Please send me the following:

☐ Read-Rite RR 110 RL-0 to 1" as shown. $18.50 Payment with order (check, money order) or C.O.D.

☐ Descriptive Catalog 30 listing Read-Rite and other Central Micrometers.

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CENTRAL *Certified Accuracy* MICROMETERS

SEE ADVERTISERS INDEX, PAGE 119, FOR KEY NUMBERS

MILITARY AND INDUSTRIAL PRODUCTION NEWS

Thirteen Armed Forces Regional Councils, with civilian chairmen, will be set up to coordinate military procurement and construction programs, and to deal with production problems at the local level. In addition to the civilian chairman, to be named by the Secretary of Defense, each Council will have representatives of each inspection office, technical service, bureau and military command concerned with procurement or construction programs. The Councils will thus provide local coordination of rules and claims of the Army, Navy and Air Force, and will settle many problems at the source. They will be located in Boston, New York, Philadelphia, Atlanta, Cleveland, Chicago, Dallas, Denver, Kansas City, San Francisco, Richmond, Minneapolis and Seattle. Exact locations and opening dates of these offices will be announced soon.

L. C. Tingley, president of Federal Products Corp. since its inception, was elected chairman of the board at the recent annual meeting of the Providence firm. Fred C. Tanner takes over the duties of president. Two new vice-presidencies were created with the election of Herbert F. Joslin as vice president—manufacturing, and Thomas L. Johnson, Jr., as vice president—research and development. The following were re-elected: Leonard B. Colt, vice president—sales; Stephen B. Reynolds, Sr., secretary; and Charles N. Kingsford, treasurer.

Machine Tool Repair. In order to free machine tool manufacturers for new production, small shops and rebuilders will be used as much as possible to recondition machine tools owned by the Army, Navy and Air Force. Military contractors will also be asked to adopt this policy to spread rearmament business among more firms.

The Atomic Energy Commission has published and placed on sale for 15 cents per copy through the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., a revised edition of its booklet describing how to do business with the AEC. It answers the questions: What is bought for the AEC? Who buys it? Where are the procurement offices located?

Hanna Engineering Works, Chicago manufacturer of hydraulic and pneumatic cylinders, valves and riveters, is celebrating its 50th anniversary this year.

Small Business. The Army has been breaking down large procurements so that small business can participate. A recent order for the purchase of 135,000 electronic control boxes was given to five firms; four manufacturers shared an order for 6000 radio sets; a million dollar purchase of 30 caliber ammunition clips was split three ways—two of them small businesses; a 13 million dollar purchase of fire control apparatus, which normally would be filled from two sources, was split into 25 contracts.

Tool and Die Orders for the first quarter of this year were 165% ahead of the first quarter last year, according to an industry estimate released by George S. Eaton, executive secretary of the National Tool and Die Manufacturers Association. The estimate also disclosed that shipments were 150% ahead the first quarter of this year, as compared with the first quarter last year, but 7% below shipments made in the last quarter of 1950.

Metal Carbides Corp., Youngstown, Ohio, announces an 8000 square foot addition to its plant, making the total manufacturing area 35,000 square feet. Office space is being doubled. Over $100,000 of new equipment, including electric furnaces, machine tools, powder mixing and crushing equipment, is being added to expand production of tungsten carbide products by over 50% as well as to provide additional facilities for defense work.

Manpower Considerations in Contract Awards. Assistant Secretary of Defense Anna M. Rosenberg has directed that the availability of labor, as shown by the Labor Department's classification of labor market areas, be considered in placing contracts and in choosing locations for plant expansion.

Alfred Fleissig has been appointed director of purchases and contracting for Hydropress, Inc., of New York, and its subsidiaries, according to an announcement by Erwin Loewy, president.

Plant Registry. A new geographical register of planned wartime producers is available from the Department of Commerce to State planning and development agencies. The register will be an aid to sub-contractors and small businesses in locating manufacturers who have made plans for production of military items.

Hole Location Practices

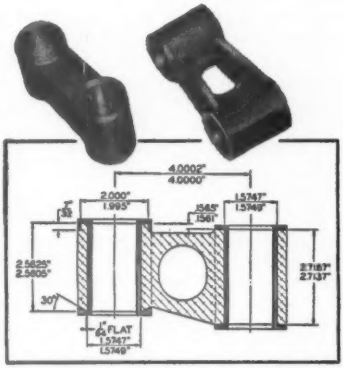
Published in the interests of greater accuracy and quality in the toolroom and on the production line by the Moore Special Tool Company, Inc. 728 Union Avenue, Bridgeport 7, Conn., builders of Jig Borers, Jig Grinders, Panto-Crush Wheel Dressers, Die Flippers, Motorized Centers and a complete line of Hole Location Accessories.

JIG BORING CUTS
Production Time 90%

It took 3½ hours to machine each of these aluminum-alloy supporting arms, used on our Moore Panto-Crush Wheel Dresser, on a boring mill. Now—on our No. 2 Jig Borer—it takes only 22 minutes per piece for lots of 100—a time saving of 90%. Hole diameters and between-centers dimensions are held to 0.0002" to insure extreme accuracy between pivot points in the wheel dresser and allow the installation of precision bearings in the holes. Read the job details at the right.

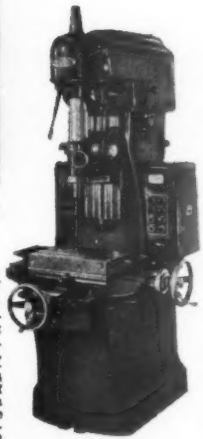
Moore Jig Borers are being used more and more on short-run production of precision work—boring, drilling, reaming and inspecting precisely located and machined holes in production parts as well as in dies, jigs and other tools.

Write today for our new 24-page catalog, containing other examples of time, and cost-cutting Jig Borer operations.



Two holes, three flat and one beveled face and shoulder on one boss (the areas crosshatched in drawing) are all machined on the Jig Borer—in only 22 minutes.

Checking hole size—held to 0.0002". Simple holding fixture provides both boring and milling positions.



No. 2 MOORE JIG BORER

Many examples of jig-boring and jig-grinding practices. 448 pages, 400 illustrations. 184 pages of Woodworth Coordinate Location Tables from 3 to 100 holes. Available at special price of $3 in U.S.A., $3.50 elsewhere. Send check or money order to Moore Special Tool Co., Inc., Bridgeport, Conn.

Oper. No.	Operation Name	R.P.M.	Feed	Min.	Sec.
1	Lead and mill ribs — Single Point fly cutter	1000	H	1	00
2	Set Up and rough bore — two holes	2000	.0015	2	10
3	Rough face two top surfaces Single Point fly cutter — Remove part to cool —	1000	H	1	35
4	Lead and second rough bore two holes	2000	.003	1	50
5	Finish bore two holes	2000	.0015	2	40
6	Check two holes for size			1	00
7	Rough and finish 30° bevel	800	H	3	00
8	Rough and finish one bottom face	800	H	1	00
9	Finish face two top surfaces Out-feed chuck	800	.0025	4	35
10	Rough and finish 2" diameter shoulder	400	H	3	00
	TOTAL TIME			21	50

SEE ADVERTISERS INDEX, PAGE 119, FOR KEY NUMBERS

. . . Here's How, from page 90

The rod is then pulled and the balls drop into the respective slots.

This procedure of dropping five balls as a sample is continued until 25 samples have been dropped, evaluated and plotted on the quality control charts. Quality control limits are then calculated, by arithmetic, and placed upon the charts. These control limits then are the maximum extremities within which the demonstrator is expected to operate, unless another cause of variation is added.

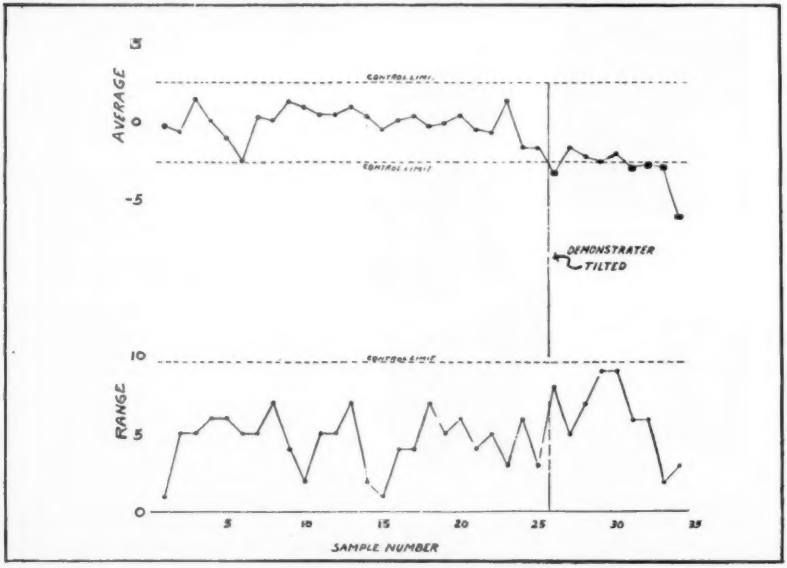
A simple explanation is made of the theoretical percentages of balls that should fall in the +1, +2, and +3 zones. The paper cover is then removed and the distribution analyzed. Analyses have been very close to the theoretical numbers for each zone.

The effectiveness of the Quincunx is then dramatically shown by extending the control limits and placing a rubber eraser ¼" to ½" thick under one corner of the demonstrator. Now by dropping more samples it will be found that the values plotted on the chart go out of control very quickly. This shows that something has been changed to give different

Slot Number		Chances In 1000
10	left	0
9	"	0
8	"	0.1
7	"	0.6
6	"	3.1
5	"	11.7
4	"	32.7
3	"	70.8
2	"	121.4
1	"	166.9
0		185.4
1	right	166.9
2	"	121.4
3	"	70.8
4	"	32.7
5	"	11.7
6	"	3.1
7	"	0.6
8	"	0.1
9	"	0
10	"	0

(Continued on page 107)

These curves were plotted by recording the distribution of the steel balls in falling through the maze. Note "misbehavior" of curves when demonstrator was changed to a tilted position.



Hi-Speed rotary filing of metal pattern

When Patterns are Finished the Haskins Way

When you file and finish metal patterns with Haskins Flexible shaft equipment, you get the precision craftsmanship that assures quality production. Designed to speed pattern, die and mold finishing, Haskins HS-4 equipment—½ h.p.—has a six-speed, Timken-bearing countershaft that develops up to 7800 r.p.m. Available with bench, pedestal or overhead mounting. The Haskins complete line of machines and attachments gives you the right combination for all grinding, sanding, filing, or polishing operations. Write today for complete information. R. G. Haskins Co., 2651 W. Harrison St., Chicago 12, Ill.

Overhead Suspension

Bench Mounted...

Pedestal Mounted...

haskins
FLEXIBLE SHAFT EQUIPMENT

HASKINS

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. . . Power Brushing, from page 47

or flaws by changing the surface appearance of castings, forgings, or machined parts. Slight defects hidden by tool marks will be revealed, and if there are none the durability of the article is increased by removing stress concentration points. There is also a brushing technique that removes fragmented metal which may hide a fracture or create the appearance of one.

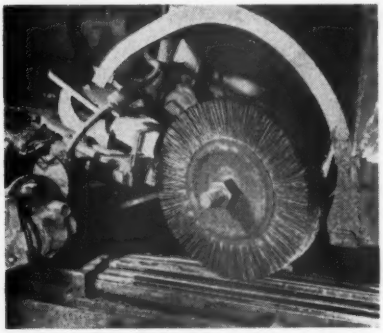

Fig. 4. Osborn brushes applied to a polishing operation on automobile window divider bars.

Size, shape and peculiarities of the work may require that a fixture be devised for holding the part at the most efficient brushing relationship. Each case is a special study.

The flexibility of brushes is one of their outstanding advantages. It is this characteristic which enables them to conform to many slight irregularities of work piece contours and to act uniformly over all of the surface, including penetration of slight recesses. In contrast to this, a more rigid wheel works on the high spots alone. By penetrating surface irregularities, the brush is able to blend edges and surfaces.

The results obtained with power brushes depend on the material with which they are filled (wire, tampico, synthetic filaments or cord), as well as on other physical specifications of the brush, such as outside diameter, diameter of fill material, type of construction, and trim length. A short trim makes a stiff fast cutting brush, a long trim gives a brush the flexibility necessary to contact irregular surfaces.

Power brushes filled with steel wire are used for removing scale from metal surfaces at speeds of 5,000 to 10,000 surface feet per minute, depending upon the type of brush used.

Natural and synthetic fiber brushes, such as tampico, cord, straight and crimped nylon, all play a vital part in removing scale on both hard and ductile metals especially where high surface finishes are required or where the ductility of the metal is such that wire brushes will damage the surface. Tampico brushes, used with brushing compounds, have applications in cases of this nature. Cord brushes find advantage where finer finishes and faster brushing action are essential, but where somewhat reduced flexibility is desirable.

★ ★ ★ ★ ★ ★

Pirating Tool and Die Makers

Defections in skilled labor will result in the vital tool and die industry unless definite government steps are taken to cut down labor pirating practices, it was stated at a recent special Mobilization Committee meeting of the National Tool & Die Manufacturers Association in New York. The skilled workers are the precision die designers and builders and they are not plentiful.

According to George S. Eaton, Executive Secretary, the industry's Mobilization Committee met to review the present status of labor pirating in the Eastern area. The recommendations will be presented to Wage Stabilization officials for appropriate action

Richard F. Moore, President of Moore Special Tool Co., Inc., Bridgeport, Conn., Herbert Murrer, President Murrer Tool Co., Cincinnati, Ohio, and Philip Marsilius Producto Machine Co., Bridgeport, Conn., cited cases of pirating in their areas. For example, when a defense plant moves into an already tight labor area, it gets authority to offer a bit more than the going rates, on the theory that the new company will not be able to offer "fringe" benefits. As a result, a skilled toolmaker moves over to a routine production job in the big company. Not only does the small company lose a valued hand, but manpower skill is wasted. The committee members said they were not in favor of any type of regulation that would "freeze" men in jobs. Their theory: a man should have the right to change. Their problem: to achieve, legally, wage rates that will keep men satisfied in their present plants.

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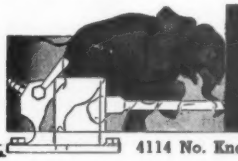

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SEE ADVERTISERS INDEX, PAGE 119, FOR KEY NUMBERS

Three-Station and Multiple Broaching

A three-station broaching machine, Figure 1, is one of the latest developments in the broaching field. It is equipped with three work slides which may be tooled for surface broaching or internal broaching. On jobs coming within the capacity of this machine, a production ratio of three to one is obtained over a single slide machine.

All work slides may be tooled for like or different operations and for this reason the machine is highly suitable for large production jobs by virtue of its high production capabilities as well as for small shops handling short run jobs where each slide may be tooled for a different operation and run independent of or in conjunction with the other slides.

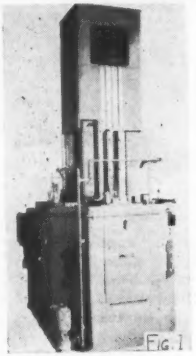


Photo courtesy Acme Broach Corp.

The machine can be set up so that there is no down time and no loss of production due to change-over of dull tools. For heavy production it can be tooled for the same operation on two or all three slides and, as one set of tools becomes dull, the operator may move to the next work position and continue without stoppage of production or, where production warrants, three operators may simultaneously broach parts on all three work slides.

Because this machine is built with a common cylinder, its cost is only slightly higher and the floor space it occupies is very little more than that of a single slide machine of like capacity.

Figures 2, 3 and 4 show tooling setups for broaching chuck jaws.

Figure 2 shows the tooling of station #1. The left-hand slide is set up for broaching an angle on the end of chuck jaws while the broach on the right produces a radius on the opposite end of the chuck jaws. The work parts may be seen just in front of the fixture.

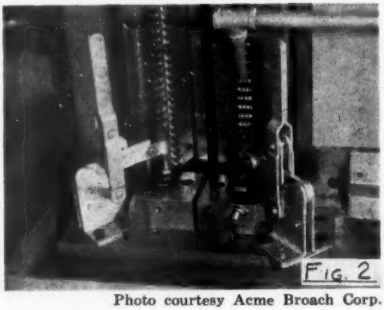


Photo courtesy Acme Broach Corp.

Figure 3 shows station #2 with a front slide and fixture arrangement for broaching double steps across width of chuck jaws.

Figure 4 shows the right-hand slide of station #3 set up for broaching wide notches across back of chuck jaws.

Broaching machines are often thought of as largely single-purpose machines. However, they are frequently used to perform multiple operations on either different parts or even on the same part.

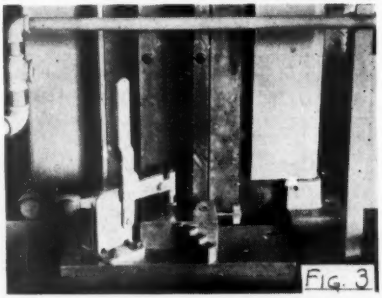
An example of the latter is the machine illustrated in Figure 5.

The part: a cylinder head used in its engines by a leading tractor producer.

The job: broaching nine valve and push rod guide bores to size, assembling nine valve and push rod guides in place; broaching valve guides to size—all with-

(continued on page 102)

Photo courtesy Acme Broach Corp.



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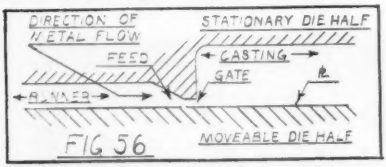

Fig. 56. Diagram showing relative positions of the runner, the feed, the gate and the die cavity for the casting in respect to one another, to the parting line and to the two die halves. While this relationship is typical, it is not fixed. Note how feed flattens out before it contacts the gate.

the gate which lies at the runner's termination. Since it is necessary to have the molten alloy pass from the runner to the gate with the least amount of turbulence and pressure drop, a feed is provided near the end of the runner. The feed starts with the geometrical shape of the runner cross-sectional area and becomes progressively smaller to blend into the geometrical shape of the gate area.

An improperly designed feed, or the lack of any feed at all, may result in:

(1) the creatio.. of much undesirable turbulence in the stream of incoming molten metal;

(2) premature heat-checking of the die steel near the gate;

(3) the presence of an undesirably thin section of die steel in the die casting die;

(4) the too severe choking-off of the molten alloy prior to its entrance into the die cavity, and/or

(5) local overheating of the die steel adjacent to the die cavity.

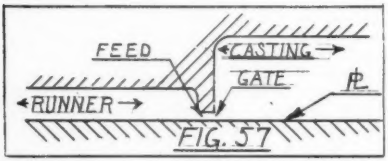

Fig. 57. Improper feed design: the change from the runner to the feed is too abrupt.

Function of the Feed

Minimization of Turbulence. Any turbulence that is created in the stream of the incoming molten alloy prior to its entrance into the die is undesirable, as such turbulence tends to restrict the uniform flow of the molten metal into the die cavity and tends also to entrap air. One function of the feed, therefore, is to minimize the creation of any turbulence. This is accomplished by streamlining the flow of the incoming molten alloy by chocking-off the flow gradually instead of abruptly, as indicated in Figures 57 and 58.

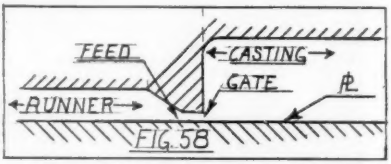

Fig. 58. Proper feed design: the feed changes cross-sectional area gradually.

Avoidance of a Local Hot Spot. If the feed is improperly designed, a local hot spot may be created near the die cavity and cooling of this hot spot by means of a water line connection is difficult. Thus, faulty feed design may cause the die casting, formed in the die cavity, to be defective. For example, if the feed tapers into the gate too abruptly, the wall of the die cavity adjacent to the gate may become overheated.

Avoidance of Pressure Loss and Overheating of the Metal Entering the Die Cavity. If the feed is tapered too greatly, as indicated in Figure 59, the molten alloy passing through it may:

(1) become overheated as a result of the increased frictional forces to which it is subjected;

(2) have its rate of flow decreased by the high frictional forces, and/or it may

(3) become overheated by the heat developed by the frictional forces.

Ease of Trimmings. A properly designed feed facilitates trimming. The feed

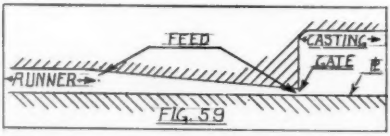

Fig. 59. Improper feed design: the feed is too long.

should blend into a "land" just before it connects to the wall of the casting; otherwise it may become most difficult to trim the casting from the feed and runner. The feed shown in Fiugre 60 does not end in a land. A properly design ed feed for a run-of-the-mill aluminum base alloy die casting is shown in Figure 61.

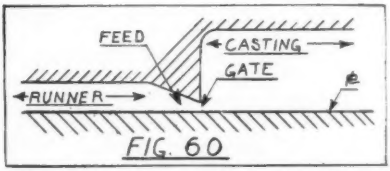

Fig. 60. Improper feed design: the feed does not terminate in a land before contacting the gate.

Shape of the Incoming Molten Alloy Stream. The design of the feed has great bearing on the shape of the incoming molten alloy stream. For example, the design of the feed may cause the molten casting alloy to enter the die in the form of a spray, or a turbulent mass of varying shape, or a steady, symmetrical jet, and since the shape of the incoming molten alloy ray determines to a considerable extent the soundness of the die casting, it is best to design the feed with some caution.

For this reason, the feed should be of a smooth, uniform taper. It should not be of such design that it creates turbulence of the molten alloy within the feed itself.

Location of the Feed

Occasionally it is necessary to design the feed in such a fashion that a portion of it must lie on either side of the parting line. When this is necessary, it is best to design the feed as shown in Figure 62.

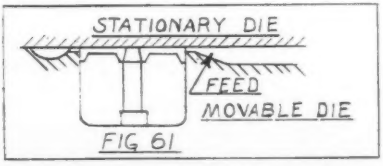

Fig. 61. Typical runner-feed-gate relationship and design leading up to a die cavity.

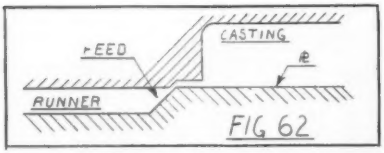

Fig. 62. Occasionally it becomes necessary to cut the runner in a half of the die, which makes it necessary to employ a feed that steps over the parting line in order to properly contact the gate of the die casting.

The Gate Proper

Strictly speaking, the gate is merely the "end-plane" of the feed, Figure 63, and as such, has only two dimensions, depth and width. The gate may be of any shape: circular, elliptical, rectangular, square, as indicated in Figure 64, and as such, it partly determines the shape of the incoming molten alloy jet.

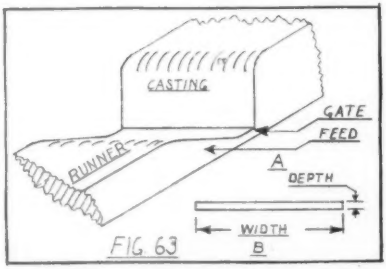

Fig. 63. The gate is a plane, and consequently has only two dimensions: width and depth.

The shape of the gate has a pronounced effect on the manner in which the molten metal fills the die cavity, viz., the gate shape partly determines:

(1) the shape of the incoming molten alloy jet;

(2) the velocity of the incoming molten alloy jet;

(3) the amount of heat generated as the molten alloy flows through the gate;

(4) the degree to which the metal within the die cavity may be fed with "new" metal at the end of the injection stroke by the applied injection pressure;

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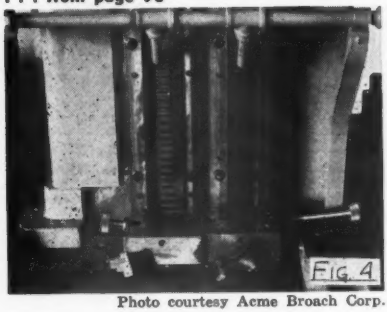


Photo courtesy Acme Broach Corp.

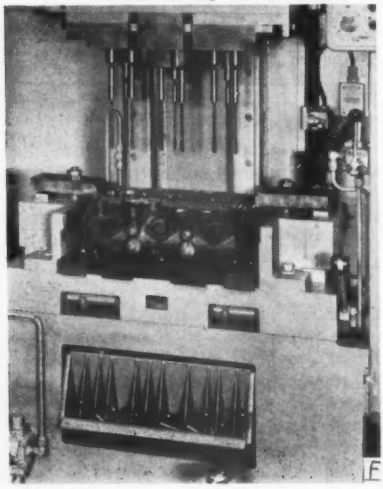
out removing cylinder head from machine.

Machine: a 15 ton, 24" stroke assembly press fitted with multiple broach holders.

In operation, the operator slides the head into place in the machine. Retracting type locating pins (interlocked with machine operation) locate the head while it is being locked in position with hydraulically actuated, manually controlled clamps.

Nine broaches, six of one size (for valve guide bores) and three of another (for push rod guide bores) now broach the bores on the down stroke of the press. At the end of the stroke, the broaches are automatically released and drop into a partitioned receptacle in the base of the machine. Meanwhile the head of the machine returns to upper position automatically.

Photo courtesy Colonial Broach Co.



The broaches for broaching the guides themselves are meanwhile placed in an aluminum pallet and the corresponding valve or push rod guides are slipped over the ends of the broaches. The lightweight pallet, Figure 6, is lifted into position under the head, engaging the broach ends in the pullers. A lever locks the broaches. The pallet is removed and the head moves down. As it does, the guides are pushed into the broached bores, a definite stop for the head assuring that they are pushed into exactly the right depth. On the return stroke of the head, the broaches are now pulled through the guides, finishing them to size.

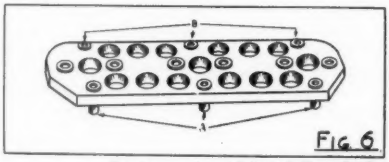


Photo courtesy Colonial Broach Co.

The pallet is lifted into place and the broaches are released, dropping into their respective receptacles in the pallet.

A lever at the base of the machine is used to bring the receptacle containing the guide-bore broaches out of the base of the machine and these broaches are re-inserted in the head (manually), ready for the next cylinder head.

Among the advantages of the setup is that the valve guide broaches actually serve as "inspection" tools for the fit of the guides in their bores. If the fit is too light, the broach pulls the guide back out on the return stroke. This is due to the fact that it takes less effort to broach the ID of the guides than to push the guides into place if the fit is correct.

Performing all operations in the same setup also assures that the spacing between all the valve and push rod guides (which must be held to close limits) are accurately maintained.

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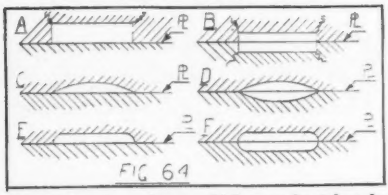

Fig. 64. Various shapes which may be taken by the gate. Sharp cornered gates may lead to the formation of cracks in the die steel, A and B. The gate may be in one half of the die, C and E, or in both halves, D and F.

(5) the formation of porosity within the die casting proper adjacent to the gate; and

(6) the ease with which the gate may be sheared off during the flash-triming operation.

The location of the gate predetermines to a major extent such things as:

(1) the manner in which the molten die casting alloy fills the die;

(2) the distance the incoming molten alloy jet travels before it impinges on the die cavity wall;

(3) the degree of turbulence in the molten alloy jet, i.e., its disintegration distance;

(4) which portions of the die cavity are filled first;

(5) the ease with which the feed may be sheared from the die casting proper; and

(6) the ease with which the subsequent surface blemish left after trimming may be removed by polishing.

The flow of the molten die casting alloy through the gate is very rapid under the influence of the high injection pressure employed, and the gate position must be such that an even flow of metal is obtained to all portions of the die cavity without any unnecessary change in the direction of flow, as this would be liable to entrap air. Where a die casting is of complex shape and freedom from porosity in one particular portion of it is essential, it is sometimes possible to concentrate on this area by suitable location of the gate.

The position of the gate should also be considered in connection with the appearance and the utility of the finished casting. The metal connecting the die casting to the runner must subsequently be removed. This may be done by filing or grinding, or in some cases a milling or turning operation may be necessary.

On many components, it is important that the marks left by the removal of the feed-to-gate joint should not be noticeable and this can frequently be accomplished by placing the gate at suitable location on the die casting. For example, when zinc base alloy gears are being die cast, it is good practice, where possible, to introduce the metal into the die cavity through the tips of the teeth.

The gate is usually from .008" to .075" thick, depending upon the alloy used and the shape and size of the die casting to be produced.

(To be continued)

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"Mothballing" Civilian Production Equipment

Industry has been advised to take a page out of the armed forces' book and put its unused valuable civilian production equipment in "mothballs" until the present defense emergency is over.

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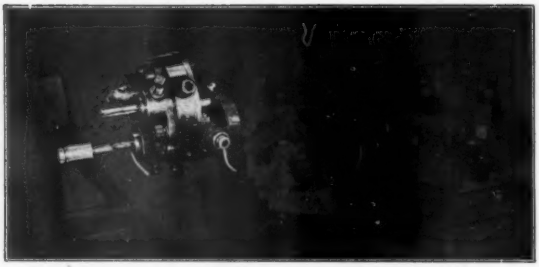
SEE ADVERTISERS INDEX, PAGE 119, FOR KEY NUMBERS

Revolving Turret Head Adapter



Designed to triple turret face capacity, the Rev-Del revolving turret head adapter of Gilmor Engineering Co. provides the time-saving factor essential in modern turret lathe and hand screw machine setups. Three-position head mounts are provided in a single turret tool position.

Basic setups requiring stop, center and chamfer can be left in the machine permanently. Spot facing, drilling, counterboring, reaming, tapping, knee tools, hollow mills, floating holders and other tools can easily be adapted.

Precision ground and lapped parts assure accurate alignment, positioning and concentricity.

The illustration shows the compact and sturdy design of this device. The adapter can readily be indexed to bring the drill into working position. It can also be seen that maximum head and side clearance, essential for cross slide operations, is allowed.

The Rev-Del revolving turret head adapter is available in 1", 1¼" and 1½" straight shank and in Morse taper shank sizes.

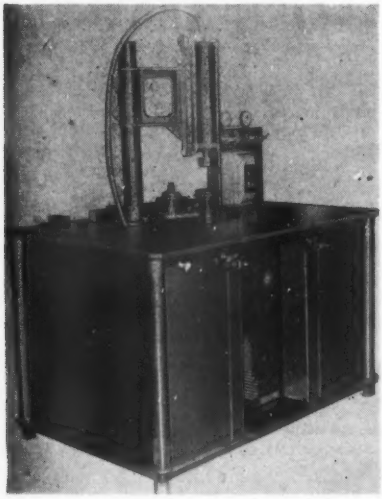
Descriptive literature on this device can be obtained from GILMOR ENGINEERING CO., Dept. T&P, 29 E. Madison St., Chicago 2, Ill.

Circle Inform-A-Gram No. D1.

★ ★ ★ ★ ★ ★

An Application of Universal Tooling to Shell Trimming

Photo courtesy Dayton Rogers Mfg. Co.



By the introduction of a universal tooling method, a new technique has been developed in flat edge trimming of square, rectangular and irregular shaped drawn shells which have small corner radii.

These trimming operations are performed on the drawn shell trimming machine shown in the illustration at left. It not only flat edge trims all drawn shells, but also has capacity for forming, offsetting, beveling, beading, serrating, stenciling and other such operations. By this universal tooling method, these operations can be performed at a fraction of the cost of conventional methods.

The trimming machine will perform all such operations on drawn shells of practically any depth and from any sheet alloy stock up to and including the No. 13 gauge thickness. The equipment is powered by a standard 3 hp, 1750 rpm motor and shop aid pressures varying from 20 to 80 pounds per square inch are required in the machine operation.

. . . Here's How, from page 94

results, which in this case is the addition of the eraser.

However, when a control chart is used on a machine, causes for variation are not purposely added so that the control chart is a very effective tool to show when the machine is operating in or out of the normal expected variation.

Other interesting probability facts can be verified by our demonstration device. The accompanying table shows the theoretical number of chances out of 1000 that any one ball dropped will fall in any particular slot. Dropping the balls shows very close results to the calculated theoretical values.

The balls are released rather rapidly, but not so fast that two or three bump into each other, until one slot is completely filled. The number in each slot is counted and the percentages of the total are calculated and compared with the theoretical.

This type of demonstration also shows (when the demonstrator is not tipped) that the pattern of a controlled process always follows a ball-shaped or normal curve. From this point on, other more technical aspects can be discussed and explained.

Our demonstrator is generally used to give the initial appreciation for quality control to small groups of not more than ten people. It has been very effectively employed in quality control training for many of our management, supervisors, foremen, inspectors and other shop personnel in the Timken Roller Bearing Company.

Modern Stampings demand MODERN PRESSES
Thomas has these types for you
INCLINABLE
STRAIGHT SIDE
HORNING
Ask for literature
EVERY Thomas Press is rugged, simple and safe in design, no matter which model you use. Not only do they do their work and do it better but Thomas Presses are featured by extreme accessibility and minimum maintenance and wear.
You'll find a Thomas Press the right answer to your problem, since tool life and production are increased and product quality improved!
P-6
THOMAS
MACHINE MANUFACTURING COMPANY
PITTSBURGH (23), PA.

Defense Contract Conference Aids Primes and Subs

The Defense Contract Conference for Ohio Manufacturers recently sponsored by the Engineering Administration Department, Case Institute of Technology, presented ideas of benefit to all manufacturers, large and small, nationwide. The addresses and discussions covered prime contracts and sub-contracts and proper procedures to follow in order to be a successful bidder on government contracts.

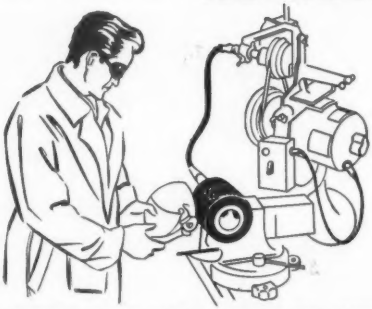
Industry was represented by Clifford S. Strike, President of the F. H. McGraw & Company; J. L. Cohill, Sr., Assistant to the President, Firestone Tire & Rubber Company; and Louis Ziherl, President, Z-W Machine Products, Inc.

F. W. McGraw & Company, is the general contractor on a new atomic plant covered by a $350 million federal contract. As general contractor on this job, the company will have to depend upon many sub-contractors for services and materials to complete the job. The McGraw company has been deluged with sub-contractors' applications, offers, circulars and form letters, which convey very little pertinent information about the material or services offered by the senders, so that it is impossible to choose intelligently a company best qualified for any particular sub-contracting job. Mr. Strike cited this experience to emphasize the necessity for sub-contracting companies, when applying for a job of this nature, to give a detailed outline of their facilities, type of material available, financial standing of the company and all other information that would have a bearing on a company's ability to carry out a contract to a satisfactory conclusion.

Mr. Cohill spoke on "How We Found Our Sub-Contractors and How We Work with Them." Firestone Tire & Rubber Company maintains a staff in Washington, D. C., Wright Field at Dayton, aircraft fields in Los Angeles, and principal cities of the country. These men work under the Defense Products Division of the company at Akron and it is their duty to establish relationships with qualified sub-contractors.

During World War II, Firestone built gun mounts that required 2300 parts, many of which were supplied by 102 sub-contractors. After two pilot mounts were built, they went

NEW, IMPROVED **NU-MATIC**



THE WHEEL WITH THE PNEUMATIC DRUM

With this Nu-Matic wheel the abrasive belt rides on a cushion of air contained in a rubber drum. Different pressures in the drum and different grits provide varied surface finishes. Deflate, and belts can be changed easily and quickly for grinding, sanding or polishing. Cut your labor, production and inventory costs with Nu-Matic grinding units. Adapters for ⅜"-11 or ½"-13 power equipment. (Specify size.)

Adaptable to bench, portable or flexible shaft power.

NUMATIC GRINDERS, INC.
8224 CARNEGIE AVE., CLEVELAND 3, OHIO

into production of 1500 mounts per month and built a total of 30,000. For the successful performance of this project, all 2300 parts for each mount had to be on hand for final assembly at a designated time.

To accomplish this, the staff of the Defense Products Division worked closely with their sub-contractors; assisted them in getting machines and materials and treated them as a division of the company.

Mr. Ziherl discussed "What Our Company Did to Get Some Defense Business." It has been his experience that the lowest bidder does not necessarily get the business. Responsibility of the bidder is considered by the government agencies as well as the bidder's quotation when awarding a contract.

When bidding on government contracts, Mr. Ziherl executes all forms fully. To give all details as to his company's ability to perform, a brochure has been prepared which accompanies their bid. This brochure contains: a list of all equipment, a history of the company, descriptions of plant facilities, machines, personnel, production facilities, floor area and key men's capabilities. It also shows everything ever made and what can be made, tools in the tool room, and services that can be performed, such as assembly and sub-assembly work.

In addition to the brochure accompanying the bid, an invitation is extended for the interested government agency to inspect the Z-W plant.

When requests to bid are received from any of the government agencies or military services and for any reason Mr. Ziherl's company cannot bid, he immediately advises the agency to that effect and gives his reason for not being able to bid. This keeps his company on the bidders list of theagency. Mr. Ziherl asserted that this procedure has resulted in satisfactory contracts and that he did not have to buy anyone a deep-freezer to secure them.

Military procurement and general services were represented at the conference by Robert W. Ackley, Chief, Industrial Planning Section, Detroit Air Force Procurement Field Office; Capt. M. A. Marvin, Air Force; Colonel Forbes, Army; Commander Bell, Navy; Paul Motz, Bureau of Employment Security, U. S. Dept. of Labor, and George A. Moore, U. S. Dept. of Commerce.

Captain Marvin, speaking for the Air Force, re-emphasized the warning: do not go to Washington in search of Air Force contracts. A listing of required aircraft products is

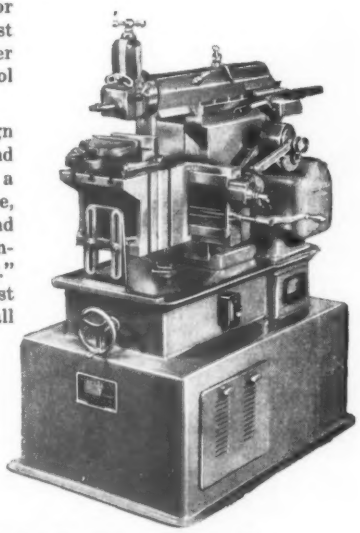
(continued on page 129)

Big Shaper Performance Small Shaper Price

The SHELDON 12" Back-Geared Shaper is neither too big, nor too small. It is just right for most shaper work in most tool rooms and shops.

In weight, design features, capacity and performance, it is a "big shaper." In price, operating cost and floor space, it resembles a "small shaper." It is the logical 1st shaper for the small shop and a cost-cutting tool in multiple installations in large plants.

Write for Catalog H45



SHELDON
CHICAGO

SHELDON MACHINE CO., Inc., 4235 N. Knox Ave., Chicago 41, Ill.

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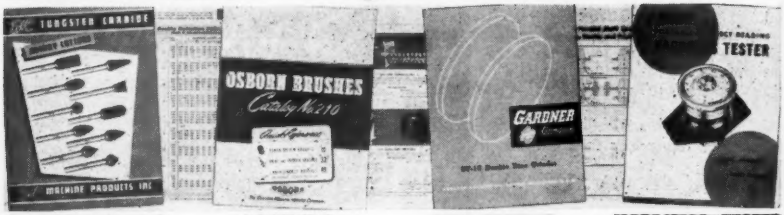
QUICK-PIC



ROTARY CUTTERS

New S & E Bulletin No. 103 illustrates in actual size all the 10 shapes now available as standard tools in their new line of tungsten carbide rotary cutters.

Circle No. E1.

BRUSHING

Osborn Mfg. Co. offers 76-page Catalog No. 210, a three-color, illustrated booklet designed to simplify selection of the best industrial brush for the individual job.

Circle No. E2.

DISC GRINDER

Model 2V-18 Double Disc Grinder of Gardner Machine Co. is used for grinding two flat surfaces simultaneously on small workpieces. An 8-pager gives details.

Circle No. E3.

HARDNESS TESTER

Principle of operation, advantages and applications of the Ernst Portable, Direct Reading Metal Hardness Tester can be found in Newage Bulletin ET.

Circle No. E4.

SURFACE GRINDER

A colorful folder gives specifications and outstanding features of the Reid Model 618 Precision Surface Grinder, which has variable table speeds of 21-35 fpm.

Circle No. E5.

"MAGNI-FOCUSER"

This Edroy binocular eye-loop speeds up and improves all precision work. A four-page folder includes complete prices and illustrations.

Circle No. E6.

SOCKET SCREWS

The latest Brighton Screw & Mfg. Co. catalog contains complete socket screw specifications and dimensional data. Photos and prices are included.

Circle No. E7.

DIE FILER

The Illinois Die Filing Machine accurately files, saws and stones the most intricate shapes; eliminates hand operations. This current bulletin describes features.

Circle No. E8.

SCREWDRIVERS

Profusely illustrated, the latest 40-page Detroit Power Screwdriver Catalog describes time-and labor-saving power screwdrivers, hopper units, nut drivers, etc.

Circle No. E12.

PUNCH PRESS

Diamond Machine Tool Co. is mailing an attractively colored bulletin that gives specifications and construction features of the latest Multi-Max Press models.

Circle No. E9.

DUPLICATING

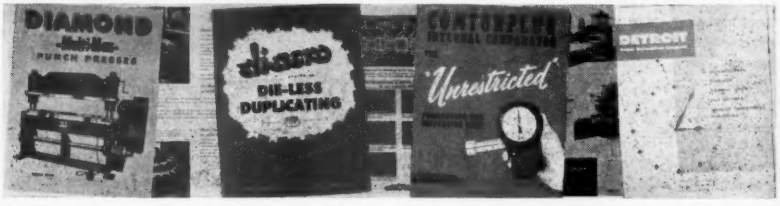
The current Di-Acro catalog of O'Neil-Irwin includes a great many operating instructions and examples in its 40 pages. Brakes, benders, punches, etc., are shown.

Circle No. E10.

COMTORPLUG

Here is an internal comparator that makes high-precision gaging available wherever needed. Detailed, eight-page Bulletin No. 40 is offered by Comtor Co.

Circle No. E11.



PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

CATALOGS

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RECESSING TOOLS

How Scully Jones Automatic Recessing Tools work is discussed in Bulletin No. 10-50. It also gives recommended setup procedures and instructions for grinding these tools.

Circle No. E13.

MAGNETIC HUMP

This Eriez unit is designed to remove tramp iron from materials conveyed in pneumatic, gravity flow or liquid lines. Bulletin 702 has construction and application data.

Circle No. E14.

VARIABLE SPEED DRIVES

Bulletin No. G-509 gives the basic operating principle of the Reeves Variable Speed Drives, contains tables and drawings in its 12 attractive pages.

Circle No. E15.

REAMERS

P&W Camlock Serrated Blade Reamers are now available in either HSS or in HSS with carbide tips. Brand - new eight-page Circular No. 507-1 gives sizes, prices, other data.

Circle No. E16.

MICROSCOPE

Looking for a really accurate shop measuring microscope? Boeckeler Instrument Company's Model No 1, described and pictured in a four-page brochure, may be the answer.

Circle No. E17.

SURFACE PLATE

The Collins "Micro-Flat" is a new black granite plate finished up to 50 millionths of an inch. An illustrated circular lists prices and sizes.

Circle No. E18.

MATERIALS HANDLING BOX

The Hazen Knock-Down Box, combining the stacking and strength of rigid boxes with the consolidation of collapsible types, is the subject of a new Jervis B. Webb brochure.

Circle No. E19.

HYDRAULIC FILTER

Wherever dirty liquids are collected and re-circulated, Dollinger Corporation's new Staynew hydraulic filter can be used. A bulletin provides the facts.

Circle No. E21.

SHAVING PRESS

Essa Shaving Presses are among the Swiss punch presses pictured and described in a new, 12-page catalog offered by the American distributor, Cosa Corporation.

Circle No. E22.

COUNTERSINKING

The latest model Black Countersinking and Deburring Machine is now equipped with a positive-type tool actuating mechanism. A brochure is offered.

Circle No. E23.

POLISHING

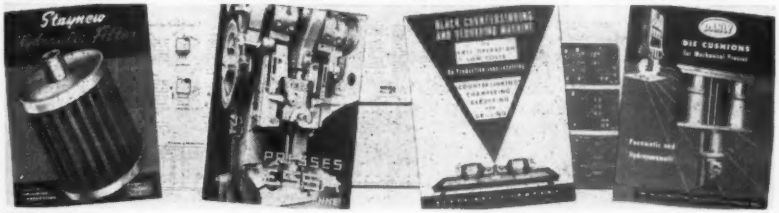
A six-page bulletin covers Production Machine Company's Type 101 Centerless Polishing Machine, a high speed unit.

Circle No. E20.

DIE CUSHIONS

Danly is distributing a 20-page booklet cataloging its entire line of die cushions for mechanical presses. A series of cushion selection charts are featured.

Circle No. E24.



SEE ADVERTISERS INDEX, PAGE 119, FOR KEY NUMBERS

WHITNEY - JENSEN PRODUCTS
41 YEARS EXPERIENCE

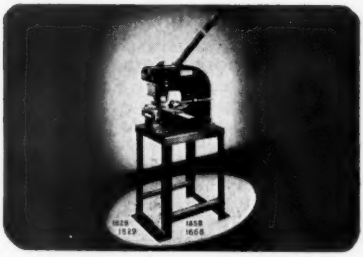
Nos. 1828 - 1829
1858 - 1868

Deep Throat
LEVER PUNCHES

Powerful geared action develops tremendous punching power with little operator effort. Extremely versatile, suitable for a wide variety of work up to capacity. Deep throats facilitate working with large sheets.

Capacity—½" thru 3/16" or 1-½" thru ⅛" mild steel—7-½ tons.

Throat Depths—7", 10", 18", 24"



WHITNEY METAL TOOL COMPANY
724 FORBES STREET • ROCKFORD, ILLINOIS

FOR HAND TAPPING or LATHE USE . . .

TAP BREAKAGE Reduced

The Dahlstrom Tap Guide stops tap breakage—saves prying out broken taps.

For Machine tapping, the spindle top is center-bored to fit the tail stock of a lathe. It's no trick at all to pull it out for lathe use. Or use the spindle as a tap extension for hard-to-get-at-places.

For hand tapping, you simply slip a tap adaptor into the spindle and twist. Easily portable, you can carry the Tap Guide to big work—rather than carrying the work to the Tap Guide. Plants with several Tap Guides in use fasten them to posts or benches spotted throughout the tool room.

TAP WRENCH
$3.

For the occasional tapping job. Fits all Dahlstrom tap adaptors. Dahlstrom TAP GUIDE

Write for Pamphlet

DAHLSTROM MANUFACTURING CO.
2508 WEST LARPENTEUR AVE. ST. PAUL 8, MINN.

Dahlstrom TAP GUIDE

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. . . Preventive Maintenance, from page 45

or the use of dirty oil. And,

2. Failure to clean filters periodically and to regularly check oil reservoirs, hydraulic pump, and pipe connections to see that no air, lubricating oil, cutting fluid, or other contaminants enter the hydraulic system.

The failure of mechanical parts, the sticking of hydraulic valves, and the erratic movements of units can usually be traced to and often follow after the lack of attention to the two points just mentioned. A minute particle of dust, a trace of lint, or any foreign substance, no matter how microscopic, may cause a hydraulic valve to stick or score. Likewise, the introduction of air, cutting fluid, lubricating oil, or other contaminant, into the hydraulic system through leakage or loose joints, causes a chemical reaction which results in oxidation and the formation of sludge. Figure 4 shows the effects of contaminated hydraulic oil on a hydraulic valve. What has been said about hydraulic valves applies also to parts of hydraulic motors and pumps. The need for using the correct hydraulic oil, for changing it at periodic intervals, and for a regular check on all connections cannot be stressed too strongly.

One way of handling the lubrication phase of preventive maintenance is to attach a lubrication chart, Figure 5, to each machine and to establish, in the maintenance department, a filing system on which a regular program of service can be scheduled.

If regular attention is given to all the points previously mentioned, machine tool users will find that preventive maintenance pays tangible dividends in less down time and more consistent accuracy over longer periods.

Firth Sterling Announces

The promotion of **W. P. Nolan** from Superintendent of Construction and Maintenance to Chief Engineer; the appointment of **T. G. Barnes**, Production Manager; the promotion of **T. F. Nakles** from Assistant Superintendent to Superintendent of Maintenance; and appointment of **J. T. O'Brien** as Works Manager of the Steel Division and Globe Wire Division of the company.

Specify CHALLENGE
SURFACE PLATE EQUIPMENT

ANGLE PLATES . . . Provide a practical and versatile method for clamping and holding work. Challenge plates are made of high grade, fine-grained semi-steel—special heat treated and precision ground to an accuracy of .0005-inch. Made in 22 sizes, from 2½x6x12 inches up to and including 18x18x18 inches. Write for complete information and prices.

BOX PARALLELS: Special heat treated and precision ground to an accuracy of .0005-inch.

V-BLOCKS: Made of fine-grained semi-steel castings. Special heat treated, precision ground. Ribbed sides.

STRAIGHT EDGES: Scientifically shaped and ribbed to retain accuracy. Made of special anaylsis semi-steel.

427

THE CHALLENGE MACHINERY CO.
GRAND HAVEN, MICHIGAN

SEE ADVERTISERS INDEX, PAGE 119, FOR KEY NUMBERS

PUBLICATION

Keep Informed! CATALOGS • BULLETINS • SPECIFICATIONS

The Tumico Over-the-Bar Micrometer makes speedy bore diameter measurements without removing the boring bar or disturbing cutter settings. This and other Tumico precision measuring instruments are described in the current catalog of Tubular Micrometer Co.
Inform-A-Gram No. B1.

Kipp Air Grinders are fully described in the current Madison-Kipp Corp. catalog. Model JA, featured in this publication, is a 50,000 rpm grinder, weighs 12 ounces, is 6¾" long. Chuck size is ⅛". The speed of the grinder drops only slightly when put to work.
Inform-A-Gram No. B2.

Grinding Valve Stems and Faces

HOW THE CORRECT CUTTING FLUID MULTIPLIED GRINDING WHEEL LIFE 8 TIMES!

THE table below shows the outstanding results which can often be secured simply by asking D. A. Stuart Oil Co. to investigate your cutting fluid requirements:

	BEFORE	AFTER
GRINDING FLUID	SOLUBLE OIL "X"	STUART'S SUPERKOOL 81X GRINDING OIL
Material	Steel Forgings Rc 30-36	Steel Forgings Rc 30-36
Stock Removal — Valve Face	Rough & Finish Grind .014" in TWO passes	Rough & Finish Grind .014" in ONE pass
Stock Removal — Stem	.004" - .006" in TWO passes	.004" - .006" in ONE pass
Average Production Per Wheel Dressing	Stem — 350-400 Face — 300-350	Stem — 2000 Face — 1200
Total Wheel Life	One Week	Eight Weeks

Write for literature and ask to have a D. A. Stuart Representative call.

D. A. Stuart Oil Co.

2729-37 S. Troy Street, Chicago 23, Ill.

New Possibilities afforded by contour grinding with continuous inspection are explored in a brand-new bulletin issued by The Cleveland Grinding Machine Co., makers of the Visual-Grind machine. Valuable features of Visual-Grind are described and typical jobs are pictured in this attractive publication. Specifications are also listed. THE CLEVELAND GRINDING MACHINE CO., 6514 St. Clair Ave., Cleveland 3, Ohio.
Inform-A-Gram No. B3.

Surface Test Dial Indicator. New literature from Superior Indicator Co. describes this double-faced instrument. A new feature is its twin contacts. The 1/32" hardened contact is threaded and telescoped inside the larger ⅛" contact without sacrifice of length. This results in accuracy of both contacts.
Inform-A-Gram No. B4.

The Brehm Trimming Die Catalog gives full particulars on the "shimmy" die, which makes a one-punch job out of hundreds of trimming tasks that woud otherwise require several operations. The Steel Products Engineering Co. is now distributing copies of this catalog.
Inform-A-Gram No. B5.

Allen Keys are now torque-resistant without brittleness. Close tolerance of the hex form and sharp key corners assure accurate fit and top gripping ability. Chamfered key ends fit socket easily. Details are obtainable from Allen Mfg. Co.
Inform-A-Gram No. B6.

PREVIEWS

Circle postage-free Inform-A-Gram Key Number for your request

New Carbide Catalog Supplement. Super Tool Co. has compiled a drill supplement (No. 4) to their regular Catalog No. 50. It illustrates and gives complete price and dimensional data on solid drills and carbide-tipped drills in a variety of spirals. Also included are "Super Hard" drills for hardened steel and core drills. The booklet contains instructions on setup, feeds and speeds, lubricants and regrinding. SUPER TOOL CO., 21650 Hoover Rd., Detroit 13, Mich.
Inform-A-Gram No. B7.

Oliver Die Making Machines are extremely fast and accurate on all sawing, filing and lapping operations. Bench Model S-1 is a single speed die maker for use on tool steel up to 1" thick. A heavy-duty model is also made for working in metal up to 3" thick. Oliver Instrument Co. will furnish complete technical data.
Inform-A-Gram No. B8.

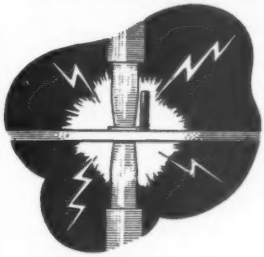
Abrasive 18" Face Grinder. Complete details and price information on this powerful, productive machine are available from Abrasive Machine Tool Co. The 18" wheel, with its 15 hp motorized spindle, "eats" its way through tough jobs where flat, square surfaces are required.
Inform-A-Gram No. B9.

Atlantic Band Saw Blades meet all the requirements for superior blades on complicated die and fixture radius cutting. The new Atlantic Catalog is now ready.
Inform-A-Gram No. B10.

Lepel High Frequency Induction Heating Units can perform all the following jobs quickly and well at low cost: hardening, brazing, melting, soldering, annealing, stress relieving, normalizing and preheating. A detailed catalog has been released.
Inform-A-Gram No. B11.

Carbide Roughing and Finishing are available to every shop through the Roto - Master Hi - Speed Grinder. This grinder's "super cooling" system permits an operating speed of 38,000 rpm. Master Appliance Mfg. Co. will furnish literature.
Inform-A-Gram No. B12.

OHIO WELD SCREWS
For economical Spot Welding



Ohio SS Spotweld Screws

Thread Sizes, No. 6-32 to ½-20

Materials:-Low Carbon Steel, Brass or Stainless Steel.

For dependable Projection Welding
Ohio GW and HW Weld Screws

Thread Sizes, No. 6-32 to ½-20

Materials:- Low Carbon Steel, Brass or Stainless Steel.

For list of stock sizes and Samples, send to

THE OHIO NUT & BOLT COMPANY
19 First St., Berea, Ohio

SEE ADVERTISERS INDEX, PAGE 119, FOR KEY NUMBERS

"Superbore" Counterbores provide that shade of difference when counterboring operations require oversizes from standard dimension holes. Twentieth Century Mfg. Co. can supply price information and descriptive literature.
Inform-A-Gram No. B13.

Cam Milling and Jig Boring Services are offered by Eisler Engineering Co., Inc. of Newark, N. J. They also do spot welding, contract production and experimental development. Full data are available.
Inform-A-Gram No. B14.

Die-Less Duplicating with Di-Acro precision machines is described in O'Neil-Irwin Mfg. Company's latest, 40-page catalog. This publication contains technical data on punches, brakes, benders, notchers, shears and rod parters.
Inform-A-Gram No. B15.

Ohio Weld Screws, for economical spot welding and dependable projection welding, are described as to size and price in current literature. The Ohio Nut & Bolt Co. will also provide samples.
Inform-A-Gram No. B16.

"Van Cut" Super High Speed Steel, just announced by Vanadium-Alloys Steel Co., has these outstanding advantages: while outperforming most high speed steels, "Van Cut" can be ground with ordinary shop techniques, and it is not subject to tungsten limitations. You can grind "Van Cut" in almost any shape for almost every type of cutting tool. Complete information is obtainable.
Inform-A-Gram No. B17.

Roll-Formed Shapes. Now available is an eight page, illustrated catalog describing Roll Formed Products Co. facilities for engineering and producing roll-formed shapes from stainless or carbon steels or from zinc, brass, copper or aluminum. ROLL FORMED PRODUCTS CO., P. O. Box 418, Youngstown, O.
Inform-A-Gram No. B18.

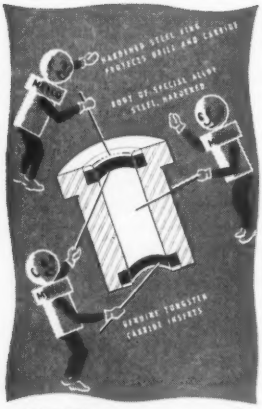
The Tornos Type R10 High-Speed Sliding Head Swiss Automatic Screw Machine and auxiliary attachments, developed by Tornos Works, Ltd., Moutier, Switzerland, are pictured and fully described in a bulletin just issued by CARL HIRSCHMANN CO., 30 Park Ave., Manhasset, N. Y.
Inform-A-Gram No. B19.

Complete Facilities for all types of precision grinding are offered by Acme Industrial Co. The firm also features a flat lapping service that can finish surfaces to within millionths. Details are available.
Inform-A-Gram No. B20.

Labor Costs Can Be Reduced and production can be increased by use of Govro-Nelson Automatic Drilling and Tapping Units. Detailed literature is offered by the Detroit manufacturer.
Inform-A-Gram No. B21.

SAVE MONEY 7 WAYS..

ON PRODUCTION DRILLING!



MEYCO

Carbide Inserted Bushings Are Doing It Daily!

HOW? Like this: (1) Last longer . . . with a life—in most cases—as long as solid carbide bushings at prices that come close to the prices of ordinary steel bushings; (2) Increased life for your drill jigs and fixtures; (3) Increased life for your drills and reamers; (4) Accuracy maintained for a LONG PERIOD of time; (5) Less non-productive machine time, less lost man hours, because bushings need not be changed as often; (6) Inspection time saved, because of greater accuracy for a longer time; and (7) Less waste due to spoilage, for the same reason. Don't pass up a good bet! Get the dope on MEYCO Carbide Inserted Drill Jig Bushings today!

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For information and prices write for Meyco Bushing Catalog No. 17

W. F. MEYERS CO., INC., BEDFORD, INDIANA

All Dial Indicators and accessories manufactured by Chicago Dial Indicator Co. are listed in a new descriptive folder. This folder introduces the Geneva Dial Indicator No. 145F, designed especially for precision checking of variations in contour, dimension or roundness within .0001". CHICAGO DIAL INDICATOR CO., Dept. A, 180 N. Wacker Drive, Chicago 6, Ill

Inform-A-Gram No. B22.

Kempsmith Precision-Built Attachments can perform the most delicate milling operations with speed and accuracy. They include vertical attachments, circular tables, slotting attachments, plain and swivel vises, hi-speed attachments, and dividing heads. Kempsmith Machine Co. is distributing detailed literature.

Inform-A-Gram No. B23.

All Lamina Dies are equipped with the Lamina patented guide pin bushing, which combines hardened steel for long wear with bronze plating for free running. The complete picture of Lamina's products and services can be found in the company's catalog.

Inform-A-Gram No. B24.

Hamilton Industrial Elevating Tables, which embody the safe and accurate Portelvator lift principle, are described in current Bulletin P-501. They are widely used in die transfer, stock positioning, elevating, and leveling.

Inform-A-Gram No. B25.

Fray's Micrometer Offset Boring Head is presented in new literature from the California manufacturer. For safety reasons, it has no projections; only smooth, round edges. It also has easily read graduations.

Inform-A-Gram No. B26.

"John's" Drill Jigs shorten setup time, save on tooling cost and speed up production on many drilling, tapping, boring, milling and grinding operations. They are made by Heuser Mfg. Co. in three standard sizes: 6", 8" and 14". Descriptive literature is obtainable.

Inform-A-Gram No. B27.

The Nobur Tool eliminates hand methods, makes hole deburring a speedy machine operation. A pamphlet from Nobur Mfg. Co. gives complete information.

Inform-A-Gram No. B28.

Boyar-Schultz SMB Machine Bolts, nuts and washers are immediately available from stock. SMB Bolts are made from upset forgings of alloy steel, heat treated for maximum properties. Full details are procurable from the manufacturer.

Inform-A-Gram No.B29.

"Molite" Molybdenum-Tungsten High Speed Steel is an outstanding producer, exempt from NPA restrictions and freely available. Full particulars can be had from Columbia Tool Steel Co.

Inform-A-Gram No. B30.

Prompt Deliveries...
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SLITTING and SLOTTING SAWS
if you order NOW!
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A complete range of sizes
available at your local dealer
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PENTON BUILDING • CLEVELAND 13, OHIO
COMMAND OUR UNPARALLELED EXPERIENCE IN CIRCULAR SAWING

SEE ADVERTISERS INDEX, PAGE 119, FOR KEY NUMBERS

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OF YOUR DESIGNERS AND TOOLMAKERS!

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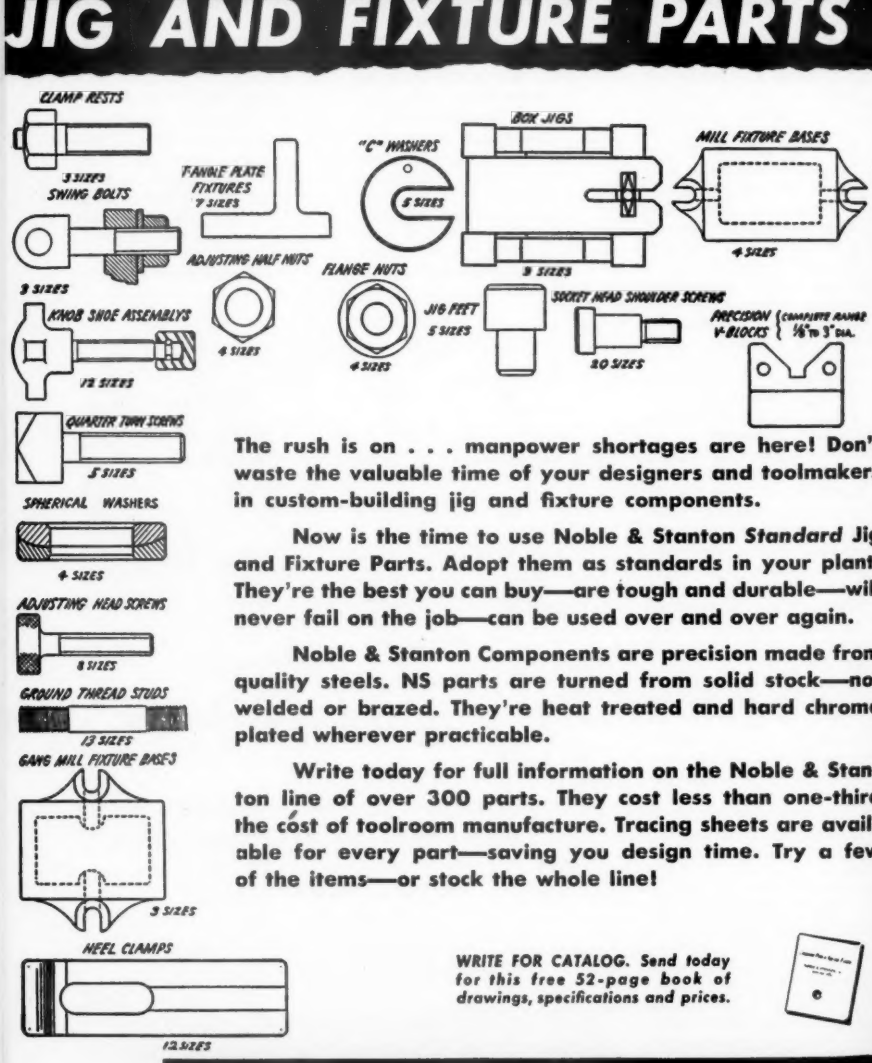

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Now is the time to use Noble & Stanton *Standard* Jig and Fixture Parts. Adopt them as standards in your plant. They're the best you can buy—are tough and durable—will never fail on the job—can be used over and over again.

Noble & Stanton Components are precision made from quality steels. NS parts are turned from solid stock—not welded or brazed. They're heat treated and hard chrome plated wherever practicable.

Write today for full information on the Noble & Stanton line of over 300 parts. They cost less than one-third the cost of toolroom manufacture. Tracing sheets are available for every part—saving you design time. Try a few of the items—or stock the whole line!

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INFORM-A-GRAM KEY NUMBERS

Quality Dies of all types, including lamination dies, blanking dies, draw dies, progressive dies and molding dies, are made by Harig Mfg. Corp. The firm will provide full information on how best to meet your die problems.
Inform-A-Gram No. B31.

Marshall Precision Ground Flat Stock, available in a large range of sizes in three grades, is the subject of a current catalog. Prices and sizes are given for WATERcrat, OILcrat and AIRcrat tool steels.
Inform-A-Gram No. B32.

Haynes Precision Castings are pictorially presented in a 20-page booklet. Composition, advantages and applications of these castings are fully described. HAYNES STELLITE DIV., Union Carbide & Carbon Corp., Dept. T& P, Kokomo, Ind.
Inform-A-Gram No. B33.

T-J Die Sinking Milling Cutters are described in Catalog 150. These Tomkins-Johnson tools will enable you to raise the feed for tough die steels because they are extra-sturdy.
Inform-A-Gram No. B34.

A "Job-Indexed" Catalog of Marking Devices, designed to simplify selection of such devices, has been published by New Method Steel Stamps, Inc. In this catalog, all standard holders for doing each particular class of work on machines or manually are illustrated and described alongside of each other so that it becomes a simple matter to select the holder best suited to any given application. NEW METHOD STEEL STAMPS, INC., 147 Jos. Campau, Detroit 7, Mich.
Inform-A-Gram No. B35.

Positive Chucking Action with one-hand control is now obtainable with the "Chuckmaster," a universal chucking device announced by Karl A. Neise. Features include instantaneous change of workpiece without loss of accuracy and easily adjustable equalized holding pressure. An illustrated circular on this device can be obtained by writing to KARL A. NEISE, Dept. T&P, 381 Fourth Ave., New York 16, N. Y.
Inform-A-Gram No. B36.

The New Kam-Grip Drill Jig is featured in a complete catalog of jigs and milling fixtures released by Manufacturing Engineering Service, Inc. This jig, which can be operated manually or automatically, permits easier and faster adjustability, as well as greater accuracy where close tolerance drilling is required.
Inform-A-Gram No. B37.

The New Mead Pneumatic Drill Press Feed quickly converts standard drill presses into semi-automatic machines for drilling, reaming and tapping at increased production rates. The latest Mead Air Power Catalog is being distributed.
Inform-A-Gram No. B38.

The Magni-Focuser can speed up and improve all precision work. This binocular eye-loop magnifies vision, yet retains depth and clarity of normal vision because dual-mounted lenses magnify objects to needle - point sharpness. An illustrated folder has been released by the manufacturer, EDROY PRODUCTS CO., 480 Lexington Ave., New York 17, N. Y.
Inform-A-Gram No. B39.

A New Short Flute, Spiral Pointed Tap, specially designed to reduce breakage on retapping and certain tapping operations, has been added to the regular line of Bay State taps. New Supplement A to Catalog No. 49 lists all available sizes and other data. BAY STATE TAP & DIE CO., Dept. T&P, Mansfield, Mass.
Inform-A-Gram No. B40.

Clamping Can Be Eliminated with the new, stronger magnetic base indicator holder introduced by Enco Mfg. Co. The duplex type magnet has a pull of approximately 100 lbs. and has a finger tip release for easy removal or positioning. Bulletin No. 602 gives the whole picture.
Inform-A-Gram No. B41.

The Complete Story of R-B Punches and Dies is contained in Allied Products Corporation's colorful, 48-page catalog. The easy installation and easy removal features of these tools cut press down time for replacement to a minimum.
Inform-A-Gram No. B42.

Horizontal Boring, Drilling and Milling Machines, in new 3", 4", and 5" spindle models, have been introduced by Lucas Machine Div., The New Britain Machine Co. Complete information is procurable.
Inform-A-Gram No. B43.

DIE-CO Spring Catalog No. 403 is offered by The Die Supply Co. The "M" and "H" spring series are made of electric furnace chrome vanadium wire with a special surface treatment to increase the safe stress load.
Inform-A-Gram No. B44.

The "Tangi-Matic" Wheel Dresser will enable you to set up for dressing any grinding wheel form in a fraction of the former time, and with precision to "tenths." The manufacturer, Perfex Gage & Tool Co., will send literature.
Inform-A-Gram No. B45.

Hy-Ten "M" Temper Alloy Steel has great toughness at high degrees of hardness and long-wearing properties for lowest unit cost. Wheelock, Lovejoy & Co., Inc., offers a detailed data book on all Hy-Ten alloy steels.
Inform-A-Gram No. B46.

The Bell & Howell Pocket Comparator is a precision optical measuring instrument for fast, accurate inspection of small dimensions. A descriptive folder has been published by the distributor, National Tool Co.
Inform-A-Gram No. B47.

SEE ADVERTISERS INDEX, PAGE 119, FOR KEY NUMBERS

Kutmore Adjustable Hollow Mills are the subject of Catalog No. 20, published by Carl Wirth & Son, Inc. They have an exclusive micrometer adjustment feature for rapid setup. Cutting capacities from 1/32" to 2" diameter are available from stock.
Inform-A-Gram No. B48.

Chicago Internal Grinding Wheels are manufactured to order and can be speedily delivered. Full information and a free sample wheel are obtainable from Chicago Wheel & Mfg. Co.
Inform-A-Gram No. B49.

Improved Features of the Procunier High Speed Tap Head are outlined in an illustrated brochure. These include: heat treated gear mechanism for long, trouble-free life; ball bearings for life-time accuracy; and simple, one-hole lubrication system. Specifications and prices are given.
Inform-A-Gram No. B50.

Dykem Steel Blue increases efficiency and accuracy in the making of dies and templates. Full information is available from the manufacturer.
Inform-A-Gram No. B51.

The Radi-Form is a small, precision-built grinder attachment that can move the work in a predetermined arc of any desired radius, from 1/16" to 2" concave, from .00 to 2" convex. This means that radii can now be generated even on carbide-tipped tools in a matter of minutes, to within .0005" accuracy on a standard, unformed, cupped diamond wheel. W. F. Meyers Co., Inc., the manufacturer, will mail detailed literature.
Inform-A-Gram No. B52.

A 16-Page, 8¼" x 12" Bulletin is devoted to the recently announced, larger, Hauser Type 5 Precision Swiss Jig Borer made by Henri Hauser, Ltd., Bienne, Switzerland. Specifications, features, examples of work and complete details on standard equipment and special accessories are covered in pictures and text. Write to the U. S. representative, HAUSER MACHINE TOOL CORP., 30 Park Ave., Manhasset, N. Y.
Inform-A-Gram No. B53.

Stalex Precision Measuring Tools are distributed in the Eastern United States by De Witt Equipment Co. The distributor is mailing a new bulletin that describes these Swedish vernier calipers, vernier depth gages and precision - graduated steel rules. DE WITT EQUIPMENT CO., 136 Lafayette St., New York 13, N. Y.
Inform-A-Gram No. B54.

Wesson Universal Vises and Angle Plates are presented in a current illustrated bulletin. These precision vises and angle plates make all angle-set jobs easy. They are applicable to angle grinding, milling, drilling, shaping, die sinking, sawing, filing, reaming, slotting, etc.
Inform-A-Gram No. B55.

TRIPLE PURPOSE MACHINE
FILES...SAWS...STONES
ILLINOIS DIE FILING MACHINE
An accurate, smoothly-operating machine that files, saws and stones the most intricate die shapes... eliminates tedious hand operations... reduces costs. It is quality-built for long, trouble-free service ... hardened and ground shafts running in bronze bushings minimize wear. The holding chuck and clamping device provide perfect file alignment.
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Stoning
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MANUFACTURERS OF METAL CUTTING TOOLS AND SHAKEPROOF PRODUCTS

The New Ross Safety Valve is the subject of illustrated Bulletin No. 304. This valve establishes new safety standards for industrial press and similar applications because of the elimination of all springs and the use of a clapper type solenoid. Installation data and a cross-sectional view of the valve are included. ROSS OPERATING VALVE CO., 120 E. Golden Gate, Detroit 3, Mich.
Inform-A-Gram No. B56.

A New Booklet on How to Build Better Tool and Die Performance through simplified tool steel selection has been published by The Carpenter Steel Co. This colorful, 16-page publication describes Carpenter steels for water-hardening, oil-hardening, air-hardening and hot-work applications. THE CARPENTER STEEL CO., 306 W. Bern St., Reading, Pa.
Inform-A-Gram No. B57.

The "Speed-Juster" is a new hand lever control that fits most 15" or 20" drill presses and other variable speed applications such as lathes and band saws. It enables speed changes to be made while the machine is in operation. Detailed, illustrated literature can be had from the manufacturer, SAVAGE MFG. CO., P. O. Box 689, Phoenix, Ariz.
Inform-A-Gram No. B58.

Federal Taperlock Plastic Gage Handles, one-third lighter than aluminum, permit extremely sensitive "touch" necessary in close tolerance work. Their lightness helps reduce fatigue from long, continuous use, makes them ideal for use by women inspectors. Details can be procured from Federal Tool Corp.
Inform-A-Gram No. B59.

Automatic Drill Heads are the subject of an interesting, 16-page bulletin published by The Dumore Co. This publication points out how these drill heads effect economies by increasing production, reducing drill breakage and cutting scrap loss.
Inform-A-Gram No. B60.

The Green Engraver is described and pictured in a recently issued folder. This engraving, routing, profiling and modeling machine can cut four lines of letters from 3/64" to 1" on curved or flat surfaces.
Inform-A-Gram No. B61.

Milwaukee Surface Plates are finished-planed and scraped to insure a highly accurate surface. Standard plate size range from 3¼" x 4" to 48" x 96". A complete catalog has been released by J. C. Busch Co.
Inform-A-Gram No. B62.

Lassy's Universal Tap and Die Guide Fixture is available from stock in three sizes. Twelve tap adapters are provided with this efficient tool. A descriptive folder can be secured from Lassy Tool Co.
Inform-A-Gram No. B63.

WESPO

FIXTURE PARTS AND FITTINGS

• • •

Shown are but 4 of the many standard Jig and Fixture items manufactured by West Point. Buy these parts ready made and save up to 75% on designing and machining costs.

Wespo parts are precision manufactured of quality steel—heat treated and cadmium plated. They are made for heavy duty and long wear.

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Also Fixture Clamps—13 styles—94 sizes. Template drawings free.

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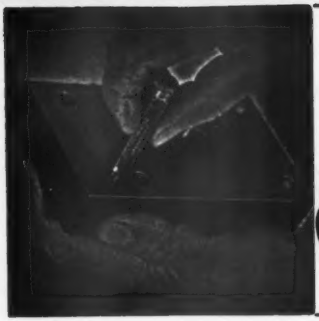

A REAL HELPING HAND

It's a help that die makers, tool makers, machinery builders and general machinists have long sought—a more accurate and surprisingly faster way of transferring screw holes.

The Heimann Transfer Screw Set is a self-contained, complete tool. No wrenches or pliers are necessary. Made in $\frac{1}{16}$" to 1" diameters.

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has been done with the
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UNEEDA LIGHT directs a beam of white light on your close precision work . . . .

Tool and Die Makers acclaim it for its utility, getting into nooks or crevices hard to get at with ordinary light—for lining up punches in dies, or working with the scriber in close places. Completely adjustable and portable. Light does not reflect back to your face. Ideal for Inspectors seeking burrs, flaws, etc. Price—complete with 2 size bulbs, $13.75.

Write for Literature

Twentieth Century Mfg. Co.
3720 Montrose Ave. Chicago 18, Ill.

Twenty-Degree Pressure Angle Gears, which save 20% in space, weight and cost, are now available from Boston Gear Works. The increased pressure angle (from the usual 14½°) permits a wider tooth base, stronger tooth, longer contact service, larger tooth bearing surface and smoother rolling action. Complete details on these standardized spur gears and steel miter gears are contained in the comprehensive Boston Gear Catalog No. 55. BOSTON GEAR WORKS, 82 Hayward St., Quincy 71, Mass.
Inform-A-Gram No. B64.

Tungsten Carbide Rotary Files, reamers, end mills, boring bits, grinding tools, knurls and small chatterless countersinks are graphically shown in the complete new catalog of The Atrax Co. In addition, this two-color catalog offers for the first time a complete line of tungsten carbide drills. THE ATRAX CO., Dept. C, Newington 11, Conn.
Inform-A-Gram No. B65.

With the Nu-Matic Grinding Wheel, the abrasive belt rides on a cushion of air contained in a rubber drum. Different pressures in the drum and different grits provide varied surface finishes. After being deflated, the belts can be changed quickly and easily for grinding, sanding or polishing. Nu-Matic Grinders, Inc., offers detailed literature.
Inform-A-Gram No. B66.

The Commander Tapper features exclusive torque control that automatically stops the unit when taps are dull, overloaded or strike bottom in blind hole tapping. It can be furnished to fit any drill press. An illustrated circular has been prepared.
Inform-A-Gram No. B67.

Stub Reamers, Dovetail Forming Tools, recessing tools and circular forming tools are described in current Bulletin No. 350 of Tri-Jay Masterform Tool Corp. High productive life is a feature of al Tri-Jay Masterform tools.
Inform-A-Gram No. B68.

Small, Precision Spur Gear Hobbing is discussed in Hamilton Tool Company's Bulletin No. H-00-49. The efficient Hamilton No. 00 Precision Spur Gear Hobber is featured.
Inform-A-Gram No. B69.

Ex-Cell-O Center Lapping Machines are fully described in Bulletin 40271. These machines correct inaccuracies of center holes that affect the quality of all subsequent operations performed between centers.
Inform-A-Gram No. B70.

A New L. C. Domack Wrench has been designed for fast wrenching of socket screws. A descriptive chart showing 16 sizes is offered by the Chicago manufacturer.
Inform-A-Gram No. B71.

FOR DETAIL MARKING OF NAME PLATES CAN BE USED ON WOOD, PLASTICS, ETC.

Now there is a new labor-saving device — one that will really save many dollars. It's the AUTOMARK Electric Metal Marking Typewriter. Its uses are almost limitless where metal marking, once a slow tedious operation, can now be accomplished in one-fifth the time formerly required. The AUTOMARK has been perfected for the detail marking of name plates — no levers to pull — no dials to spin—it's all-electric, with automatic table feed. It actually will reduce the cost of production dollars five times by its speed. Strong enough to mark on steel up to ½" thick, yet can be adjusted to mark on wood or plastics. Simple to operate, it has a letter wheel made from high grade alloy tool steel. Type sizes interchangeable—1/32" to ¼" — any size wheel can be inserted quickly, easily.

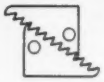
For further information write Dept TDJ

CADILLAC STAMP CO.
17315 RYAN ROAD • DETROIT 12, MICH.
3000 IRVING PARK • CHICAGO 18, ILLINOIS

Mfd. by Defiance Machine & Tool Co., Inc., St. Louis, Mo.

SEE ADVERTISERS INDEX, PAGE 119, FOR KEY NUMBERS

REID SET-UP AIDS



STEP SET-UP BLOCKS
Hardened Steel or Maple

MAGNETIC BLOCKS AND PARALLELS

PYRAMID SET-UP BLOCKS

T-SLOT BOLTS

Also hand wheels, machine handles, levers, cranks, plastic balls, cast iron knobs, machine vises

Write for catalog and prices on complete Reid line

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WHICH ARE YOU USING?

. . . the grunt-pull, hammer-wrecking bar, costly method of die separation . . . using two or three men? Results are pinched fingers, scored pins, battered dies and waste of time and money.

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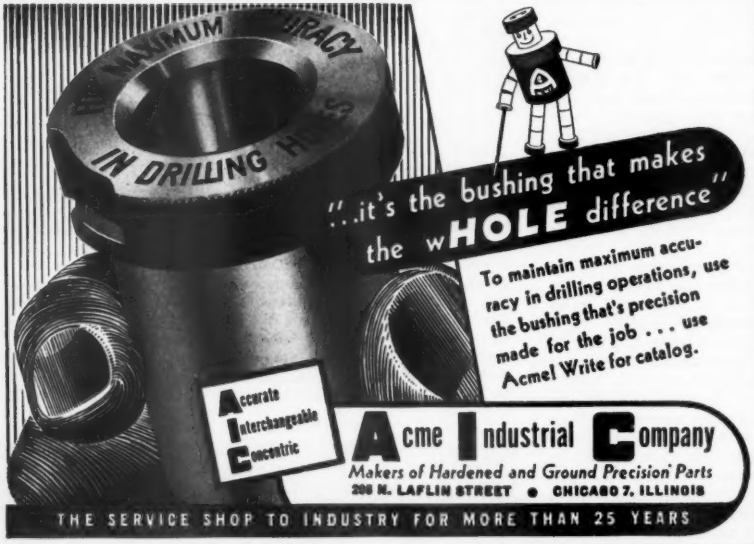
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The DUPLIform Method of reproducing intricate form ground contours of extreme precision is detailed in Bulletin 201. The DUPLIform machine combines a profile surface grinder of tenth-splitting accuracy with a built-in universal dresser. Copies of Bulletin 201 are obtainable from the manufacturer, Airborne Accessories Corp.

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The U. S. Multi-Stop, essentially a protective and inspection device for dies, tools, presses and other machines, is the subject of a new U. S. Tool leaflet. This publication contains illustrations and a list of the many different applications for the Multi-Stop. U. S. TOOL CO., INC., Dept. T&P, Ampere (East Orange), N. J.

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Use of Angle Computers can cut layout, tooling and inspection time in half. The Angle Computer is calibrated in minutes and can be rotated 360° in three directions: horizontal, vertical and radial. Angle Computer Co., Inc., will provide complete details.

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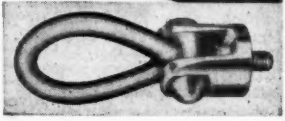

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. . . **Defense Contract, from page 109**

posted in the local offices of the Air Force and all information in connection with bidding procedures is available there. Because 50 to 63% of aircraft parts are made by sub-contractors, there are many opportunities open to both small and large plants to participate in this business as sub-contractors.

The Air Force procurement offices require a complete description of a bidder's plant capacity so that it can be determined whether the bidder is in a position to perform satisfactorily under the terms of the contract.

If a successful bidder encounters difficulty in procuring materials, he will find his local Air Force office willing to assist him in obtaining the items required to complete his contract.

Colonel Forbes, representing the Cleveland Ordnance District, U. S. Army, pointed out that the Cleveland office is one of 14 offices throughout the country which can place negotiated contracts. Getting an Army contract is similar to getting business from any industrial company, that is, a selling job must be done and evidence must be presented to show that the contractor is responsible and able to fulfill satisfactorily the requirements of the contract.

Commander Bell of the Naval Material Procurement office discussed some of the changes which have been instituted in the procurement of naval materials. Purchasing has been de-centralized so that purchases can be made by the supply offices through competitive bidding.

It is required now that prime contractors must place a certain percentage of their contract with sub-contractors, thereby encouraging the spreading of the sources of supply.

Commander Bell also emphasized the necessity for their office to have complete information about the bidder's plant facilities and pointed out that the lowest responsible bidder gets the business. Unsuccessful bidders are notified by postcard.

Mr. Ackley spoke on "Military Procurement Methods." He said that during World War II all the services by the procurement division erent inspection specifications for the same item. A revision has been made in this procedure so that now the same contract and inspection specifications are applicable to any item used by all the services. Also, the three services, Army, Navy and Air Force, now cooperate in their purchases. An item used by all three services is purchased for all the services by the procurement division of one of the services. For example, the Navy buys all the Westinghouse jet engines used

(continued on page 131)

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Screw Machine Maintenance

The simple application of a thread insert has served to prolong the life of the carriage slide and to reduce the maintenance cost on automatic screw machines for the Pacific Screw Porducts Corp. of South Gate, Calif.

For some time Pacific engineers faced the problem of having to replace the carriage slide whenever the tapped hole securing the turret locking-pin lever stud became stripped.

Recent tests which consisted of retapping the hole and installing a thread insert, thus restoring the internal thread diameter to its original dimension, proved as satisfactory as the original fitting.

When the internal thread again becomes stripped, the insert is simply extracted and replaced with a new one.

Pacific Products officials predict that this will save the company thuosands of dollars which are normally expended for carriage slides each year.

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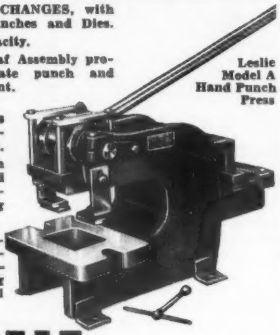
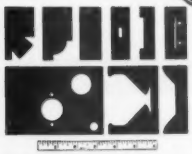


Leslie Model A Hand Punch Press



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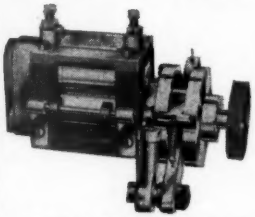

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Complete information on request

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. . . **Defense Contract, form page 129**

by all three of the defense service branches.

Mr. Ackley cautioned prospective contractors to read carefully the terms, specifications and the fine print on a government contract before signing it, because after a contract has been signed by a contractor and accepted by the government agency, the contractor cannot reject it. He cited the case of a stove manufacturer who had built stoves on which 16 gauge steel was specified. A new contract for additional stoves was executed and the contractor, without reading the fine print, built approximately 450 stoves of 16 gauge steel. It so happened that a change in the gauge of the steel had been made in the new contract, but the contractor missed it because he did not read the fine print of his contract. These stoves were rejected and the contractor had a lot of stoves to peddle as best he could.

Mr. Ackley suggested that prospective contractors, either prime or sub—, prepare a check list covering plant facilities such as: materials, supplies and components used or produced; personnel, labor sources, training and industrial relations; production and production control; plant layout, equipment, maintenance and expansion; shipping; research and development; plant security and damage control.

All the speakers representing the services were emphatic in stressing the necessity for prospective contractors to be able to present convincing evidence that their companies are capable of performing satisfactorily under the terms of a government contract and that the lowest bidder does not necessarily get a contract, but it is the lowest responsible bidder who gets the award.

Cartridge Case Production

A $5,000,000 contract for the production of large caliber steel cartridge cases for ammunition has been released to the Chicago plant of Ingersoll Products Div., Borg-Warner Corp., by Col. S. R. Stribling, Chief of the Chicago Ordnance District.

R. S. Ingersoll, division president, has announced that his company plans about 30,000 square feet of new construction which, with 15,000 square feet of existing facilities, will house the project.

Although the manufacture of steel cartridge cases requires more operations than brass cases, the resulting higher labor cost is more than offset by the lower cost of the raw material. In this way the Ingersoll contract will save the government thousands of dollars as well as critical copper and other metals used in brass shells.

Approximately 100 operations are needed to form the case from specially processed steel blanks.

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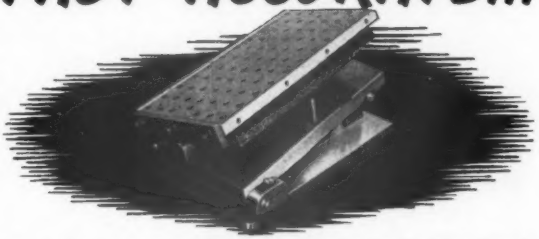

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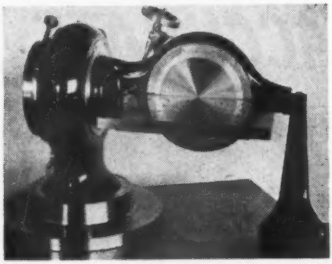

Layout, tooling and inspection time can be cut in half by using Angle Computers. The Angle Computer is calibrated in minutes and can be rotated 360 degrees in three directions—horizontal, vertical and radial. Save TIME and MONEY where layout, inspection and machining of castings, forgings, tools, dies, jigs, fixtures, or patterns include angles and compound angles.
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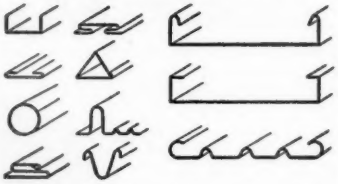

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— this month's book review —

"Mechanical Measurements by Electrical Methods,"
by Howard C. Roberts.
The Instruments Publishing Company, Inc., Pittsburgh, Pa., publisher. Price $4.00.

For a number of years the need for a book on "electric gaging" methods has been apparent, becoming more evident with a growing awareness that "electric gaging" principles find use in many fields of measurement and of automatic control. This need became critical as the number of practical but uncommercialized methods outgrew any engineer's ability to find them in his company's library or in large technical libraries.

Measuring methods have been developed by different engineering groups for their own profession but with no relationship to other professions.

Thus a specific need existed for an author, equal to a committee in scope of experience and better than a committee in discrimination, to compile the existing data into one volume. Howard C. Roberts was well qualified by experience to bring all the available data together. He has specialized in electric gaging and vibration studies, applying the fruits of his work to wide industrial fields ranging from geophysics to railroads and from photometry to plastics.

A valuable feature of this book—especially valuable to busy workers—is the way Mr. Roberts planned its general arrangement into two distinct parts: Part I, Principles and Part II, Equipment.

In writing his book, he has attempted to do two things: (1) to provide a sound foundation for further detailed study by any engineer who wishes to specialize in electrical methods for mechanical measurements; (2) to acquaint the non-technical or semi-technical reader with the possibilities of the available methods. He has touched only lightly on mathematics and academic theory but, through lucid discussions and vivid descriptions with numerous illustrations, has adequately covered all the available material: the already-published material and several original contributions of his own. One such contribution is the set of chapters discussing the basic theory of bridge and potentiometer circuits. Though brief and intended to apply only to the use of such circuits in measuring displacement, vibrations, etc., these three chapters constitute a useful manual of d-c and a-c bridge potentiometer circuits.

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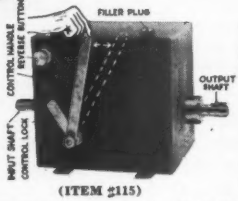

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Both input and output shafts measure ⅝" diam., include keyway. Input rotation is counter-clockwise facing shaft. Recommended input speeds not to exceed 750 R.P.M. Over-all dimensions 7½"x7½"x11½". Gov't. acquisition cost, $428.00. Shipping weight 26 lbs. Complete with 2 qts. of oil and full instructions. F.O.B. Chicago **54.50**

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Maintenance • Repair • Operation (MRO)
31 Questions and Answers Covering N P A Regulation 4

1. Q. What is the purpose of NPA Regulation 4?

A. Its purpose is to provide a ready means whereby all business establishments and other non-business institutions—large and small—may when necessary use a priority rating to obtain supplies and materials they require for maintenance, repair and operating supplies.

2. Q. Why is this regulation necessary?

A. One of the basic aims of the National Production Authority is to maintain the nation's production to strengthen its defenses. This makes it imperative that existing facilities and equipment be maintained in top working condition.

3. Q. How does Regulation 4 accomplish this purpose of maintaining our present production facilities?

A. It permits all business enterprises, large or small, whether engaged in retail or wholesale trade or in manufacturing, to use an extendible DO-97 rating to obtain needed maintenance, repair and operating supplies (MRO).

4. Q. What is meant by "extendible DO-97 rating?

A. Under NPA's basic priorities system, certain essential production is given preference. "DO-97" is the preference symbol assigned by NPA for use on orders for maintenance, repair and operating supplies. This preference rating may be extended by the person receiving the rated order in the same way as any other DO rating may be extended.

5. Q. Is there any special significance to the number "97"?

A. The number is used for identifying the MRO program, just as other programs are identified by a two-digit number. There is only a single-band priorities system, which means that all orders with a priority rating, regardless of the program identification number, receive equal treatment.

6. Q. What about other organizations, such as schools, hospitals, churches and government agencies?

A. Regulation 4 includes them, too. Federal, State, municipal and other governmental units may use the DO-97 rating, and so may schools, libraries, churches, hospitals and similar institutions.

7. Q. Does the regulation exclude any type or types of institutions?

A. No. All institutions in the United States and its possessions and territories when necessary may use DO-97 ratings to get the maintenance, repair and operating supplies they require.

8. Q. Is any special authorization required from NPA for the use of the rating?

A. No. The regulation is self-explanatory and the rating may be used by any concern in accordance with Regulations 4 and 2.

9. Q. Is there any limitation on the amount of these supplies a business or institution may obtain?

A. Yes. In general, MRO supplies may be obtained only in the same dollar amount spent for such supplies during 1950.

10. Q. Must MRO quotas be figured on a quarterly basis?

A. That is right. Businesses, government agencies and institutions simply divide the amount they spent for MRO in 1950 by four and that is their quarterly quota.

11. Q. Is any provision made for seasonal business?

A. Yes. A business or institution that desires to do so may take as its quarterly MRO quotas the amounts spent for MRO in the corresponding quarters of the calendar year 1950.

12. Q. How does a new business establish its MRO quota?

A. If it was in operation during part of 1950, it is permitted a quota in proportion to the amount spent while it was in operation, with reasonable adjustments for seasonal and other variable factors.

13. Q. What about new firms started during 1951?

A. They are permitted to acquire for MRO purposes the minimum amounts necessary for operation, up to $5,000 a quarter. They must obtain special NPA permission for MRO expenditures above this amount. When the quarterly quotas for these businesses exceed $1,000, the NPA must be informed in writing of the base period used, the reasons for selecting it, and what adjustments have been made.

14. Q. Many firms operate on a fiscal-year rather than a calendar-year basis. How do such firms determine their quarterly MRO quota?

A. Any firm or institution may, if it wishes, use its fiscal year rather than the calendar year in establishing its quota.

15. Q. Is a business firm or other institution required to use a DO-97 rating to acquire the MRO supplies it needs?

A. No. MRO may be obtained without using the DO rating. But if a person does make use of this rating, then his total acquisition of MRO, both rated and unrated, becomes subject to the quarterly limitations of the Regulation.

(Continued on page 152)

Modernization of Casting Cleaning Methods

Installation of new methods for cleaning castings by Yates-American Machine Company, Beloit, Wisconsin, has affected production in nine ways:

(Photo courtesy Pangborn Corp.)

A "turn-style" airless centrifugal type machine permits a practically continuous flow of cleaning. One load is always inside the chamber revolving under the blast stream while the other table is outside in loading

1. Additional floor space has been made available.
2. Skilled workmen have been released for re-employment in other operations within the plant.
3. Small castings are cleaned six times faster.
4. Large castings are cleaned three times faster.
5. Castings are more thoroughly cleaned.
6. Grinding time has been reduced.
7. Inspection has been made more efficient.
8. Employee morale has been improved.
9. Maintenance is now done during working hours.

Yates-American Machine Company manufacturers woodworking machinery and heat transfer equipment. Five old-style tumbling mills were used to clean

(Continued on page 136)

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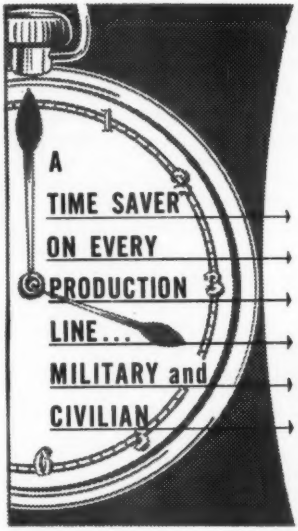

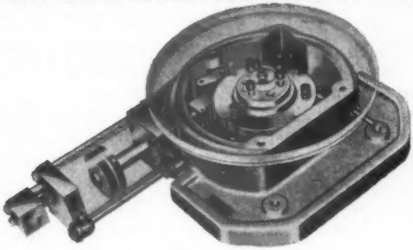

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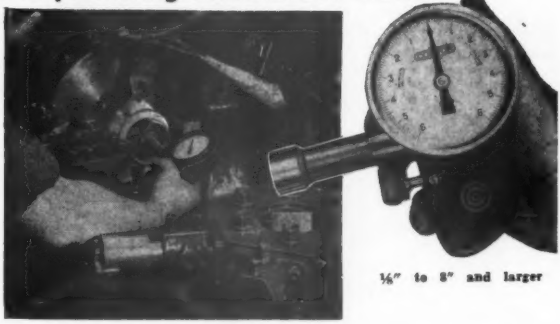

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For data on COMTORGAGE Precision External Gage, request Bulletin 30.

SEE ADVERTISERS INDEX, PAGE 119, FOR KEY NUMBERS

Double-End Coil Spring Grinding

Grinding coil springs more quickly and economically, with a corresponding increase in accuracy and all-round quality, is accomplished by the double vertical spindle disc grinder with semi-automatic cycling.

Listed among the advantages of this new grinder are extra flexibility, time saving, increased wheel life, conservation of floor space, and overhead economies.

The machine grinds springs from ½" to 6" long, from ¼" to 4" diameter, and from .0625" to .500" wire diameter. The abrasives are especially constructed to grind a variety of spring types as well as materials such as oil tempered steel, music wire, and bronze wire. This eliminates down time for wheel changeover.

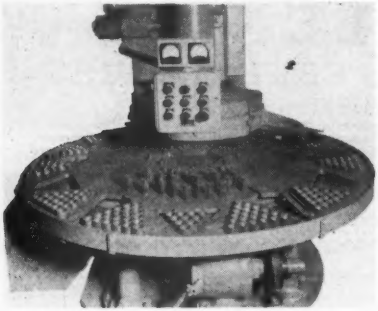

Fig. 1. The tube clamping method gives the grinder more flexibility, especially for short runs. Assembly of a group of tubes, and clamping them in the feed wheel openings, is no problem.

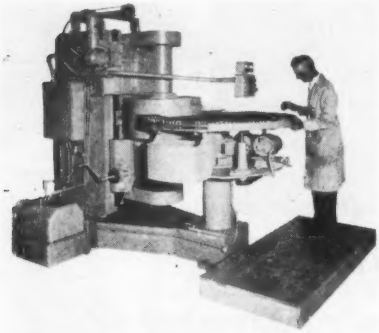

Fig. 2. The principle of feeding the head down during the grind permits a finished operation with each loading.

(Photos courtesy Charles H. Besly & Co.)

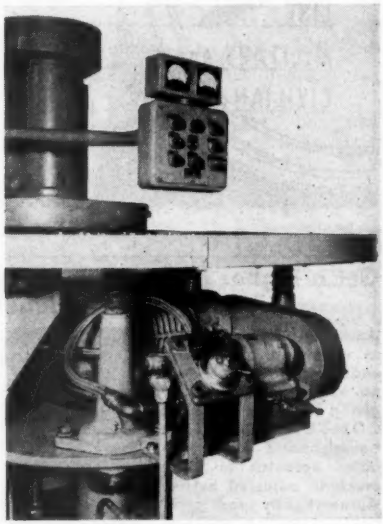

Fig. 3. All push button stations are arranged in this compact control panel directly in front of the operator. This assures simplified, speedy operation.

The springs pass across the center of 30" diameter abrasives which have no center holes. This eliminates down time for dressing, and abrasive loss resulting from the customary wheel truing operations. The result is that two abrasive discs will produce up to six times the ordinary number of springs, with an

(Continued on page 151)

Your Production Load with FEDERAL TAPERLOCK PLASTIC GAGE HANDLES

LIGHTWEIGHT and DURABLE—FEDERAL Taperlock Plastic Gage Handles are *one-third lighter than aluminum!* Permits extremely sensitive "touch" necessary in close tolerance work. Lightness helps reduce fatigue from long, continuous use. Ideal for use by women inspectors.

IDEAL FOR GLASS GAGES—The light weight of FEDERAL Gages reduces danger of chipping and breaking if dropped.

IDENTIFICATION MARKING—Quickly done with the same stamps and tools used for marking handles of other materials.

INSULATION—Plastic possesses insulating properties that protect gages from bodily heat that might affect accuracy.

STANDARD SIZES—FOUR COLORS—Available in four standard colors: for quick identification—red, yellow, green and black—in seven (7) sizes: 00-0-1-2-3-4-5.

Made of durable plastic, FEDERAL Taperlock Gage Handles are tough and long-lasting. They do not mar or chip with severe use. Increase the efficiency of your production workers with FEDERAL Plastic Taperlock Gage Handles.

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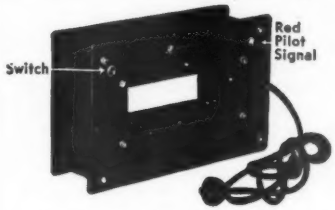
Save TOOLS · TIME · LABOR with the Improved · AMC · DEMAGNETIZER



No shop or toolroom can afford to be without one. Thoroughness of the AMC Demagnetizer will give greater precision to finished parts.

One pass through AMC Demagnetizer removes all magnetism from processed parts. Large flat surfaces are demagnetized by sliding unit over surfaces.

● **Our AMC Demagnetizer will pay for itself in a few weeks. Standard units available.**

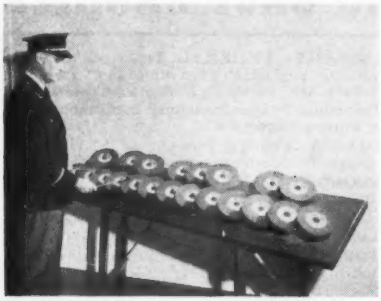
▶ *Write today for illustrated circular.* ◀

ALOFS MFG. CO.
1619 Madison Grand Rapids, Mich.

SEE ADVERTISERS INDEX, PAGE 119, FOR KEY NUMBERS

The Music of the Grinding Wheels

Although grinding wheels are intended for grinding, vitrified bonded wheels have another characteristic entirely divorced from grinding—a characteristic



The "Wheel-O-Phone" uses 21 eight-inch Norton grinding wheels.

widely used in determining both the soundness and grade of hardness of the wheel.

Vitrified wheels are similar in some ways to fine china; both are bonded with a vitreous clay, and just as a light tap on fine china produces a clear, bell-like tone, so do vitrified bonded grinding wheels ring with a clear sound.

The history of the "Wheel-O-Phone" goes back to 1911. In that year at a meeting of Norton salesmen and foremen, a part in the evening's program entitled "Tap Them Lightly before Mounting and Listen to the Ring" was presented to demonstrate the tonal qualities of Norton abrasive wheels. Eight to ten tool grinding wheels were set up on a stand and several simple tunes were played.

The "Wheel-O-Chimes" is made from ceramic bonded grinding wheels.

"Cruci-Bells" are a collection of 18 pure oxide refractory crucibles with other Norton products as handles and clappers.

The next use of these wheels as an instrument came around 1925. Another set of wheels was developed to show the application of sound as a method of grading, for another sales conference. It was in connection with these grading studies and the research attempts to make grinding wheels better that resulted in the development of Norton "B", "BE" bonds.

(Continued on page 149)

Light Touch Department: What could be worse than being all set to throw a banquet for your "25-Year Men" and to have the orchestra not show at the last minute? This short story, reproduced by kind permission of the Norton Company from their "Grits and Grinds," shows how the grinding department can come to your rescue. Just raid the tool crib and there's your music, vitrified instead of canned! **E. W. P.**

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FURNACE
$145.50
F.O.B. Factory

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SEE ADVERTISERS INDEX, PAGE 119, FOR KEY NUMBERS

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Jig and Fixture Template Sheets. The current catalog of Jergens Tool Specialty Co. contains more than 80 pages of valuable template drawings of standard jig and fixture parts available from the company. Address JER-

GENS TOOL SPECIALTY CO., 712 E. 163rd St., Cleveland 10, Ohio.
Circle Inform A-Gram No. C1.

A New 68-Page Booklet on Aircraft Steels, including a condensed listing of the essential features of the new Military (MIL) Aeronautical Specifications, has been issued by Joseph T. Ryerson & Son, Inc. Included is a digest of many of the Air-Force Navy (AN). Federal (QQ) and Aeronautical Material specifications (AMS) pertaining to steel, plus the nearest corresponding AISI analyses. JOSEPH T. RYERSON & SON, INC., Box 8000-A, Chicago 80, Ill.
Circle Inform-A-Gram No. C2.

How to Make Chuck Jaws is detailed in Bulletin B5, which is offered by Cerro de Pasco Copper Corp. This publication describes and pictures an easy and economical method for making chuck jaws by the use of Cerromatrix, a low-temperature-melting bismuth alloy. CERRO DE PASCO COPPER CORP., 40 Wall St., New York 5, N. Y.
Circle Inform-A-Gram No. C3.

Cemented Carbide Products. Kennametal Inc. has released its Catalog 51, a liberally illustrated, 72-page book containing useful data on carbide tools, tips, inserts, etc., and how best to use them. Information is given about grade selection, cutting speeds, machining hints, grinding, tool wear analysis, design suggestions, and applications. Complete price and size information is listed for the entire Kennametal line. The visual index on the inside front cover is a time-saving feature. Copies of this comprehensive book can be obtained by writing to KENNAMETAL INC., 500 Lloyd Ave., Latrobe, Pa.
Circle Inform-A-Gram No. C4.

Ball Bearing Handbook. The 20th edition of Volume I of the New Departure Handbook contains the data necessary for the selection and application of ball bearings for general use, including dimensions, load ratings, load conversion factors, bearing tolerances, and shaft housing fits. This 140-page book has an index that shows at a glance the basic bearings listed and the additional features with which they may be obtained. Tabs lead directly to the particular information required. Address NEW DEPARTURE, Div. General Motors Corp., Dept T&P, Bristol, Conn.
Circle Inform-A-Gram No. C5.

Lathe Operator's Handbook. A new and revised 50th edition of "How to Run a Lathe" has been published by South Bend Lathe Works. The current edition of this well-known reference book has 128 pages and over 350 illustrations. It contains 11 chapters written in non-technical language. The book is available in paper binding at 25¢ or in imitation leather fabrikoid binding at $1.00 a copy postpaid. SOUTH BEND LATHE WORKS, South Bend 22, Ind.

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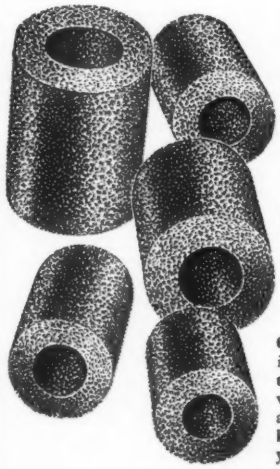

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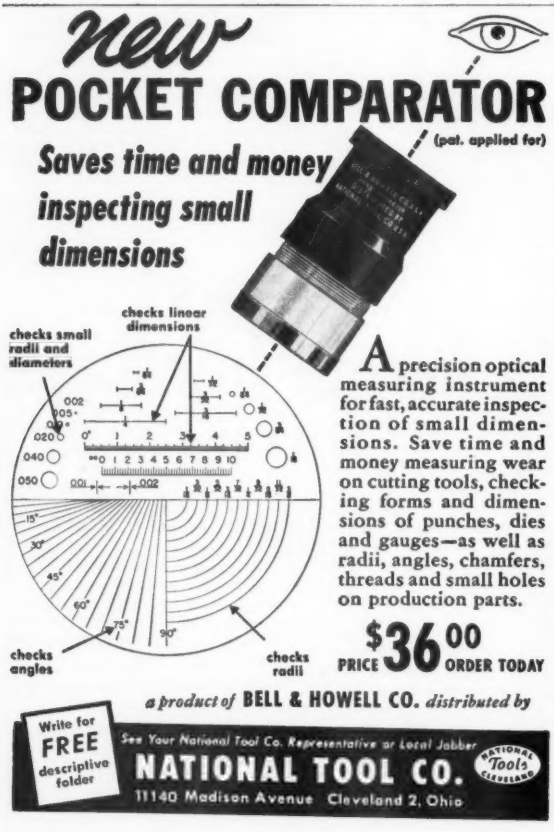
Chicago 7, Illinois

SEE ADVERTISERS INDEX, PAGE 119, FOR KEY NUMBERS

Cutting and Grinding Facts on more than 50 typical metalworking jobs are presented in an 80-page, Sun Oil Company booklet. Many of the operational data presented in this two-color publication are based on latest information supplied by leading builders of automatics, grinders, lathes, millers, etc. The booklet also presents descriptions of Sun's straight and emulsifiable cutting oils. Of practical use to the shop man is a chart showing the correct Sun cutting fluids for many of the most frequently used metals and machines. Write on letterhead to SUN OIL CO., Industrial Products Dept., 1608 Walnut St., Philadelphia 3, Pa.
Circle Inform-A-Gram No. C6.

"Machining Copper and Copper Base Alloys" discusses basic machining operations and gives suggestions for tool rakes and clearances, and also for cutting speeds and feeds. Released by The American Brass Co., this attractive, 30-page booklet gives data on lathe turning tools, cut-off or parting tools, form tools, drills, reamers, taps, etc. Technical descriptions of Anaconda Rods are included. THE AMERICAN BRASS CO., Dept. T&P, Waterbury 88, Conn.
Circle Inform-A-Gram No. C7.

Ten Case Studies of interesting broaching operations are presented in a current catalog, "Better Broach It," available from The Connecticut Broach & Machine Co. Ten double pages show these studies, together with engineering data, drawings and photographs. A pocket contains useful broaching standards. THE CONNECTICUT BROACH & MACHINE CO., Dept. T&P, New London, Conn.
Circle Inform-A-Gram No. C8.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The Proper Mounting Technique for grinding wheels on sleeve type mounts is discussed in a new publication of the Grinding Wheel Institute. This 12-page booklet makes recommendations covering the amount of torque or "wrench pull" to use when mounting grinding wheels on several makes of cylindrical grinding machines. The recommendations are based on the results of recent experimental field tests. For copies of this booklet, write to GRINDING WHEEL INSTITUTE, P. O. Box 64, Greendale, Mass.
Inform-A-Gram No. C9.

Precision Investment Castings. General technical and design data for precision investment castings are available in a publication recently issued by Hitchiner Mfg. Co. This booklet covers costs, tooling, both small and large quantity production, how complex shapess can be handled, size limitations, finish and tolerances. One section is devoted to the physical properties of investment castings and another, to basic designing information. HITCHINER MFG. CO., INC., Dept. T&P, Manchester, N. H.
Inform-A-Gram No. C10.

A Planning Guide for Industrial Air Conditioning, offered by Westinghouse, discusses the vital functions an air conditioning system should perform, what to expect from such a system, and factors to consider when actually planning a system. Write for Booklet B-5160 to WESTINGHOUSE ELECTRIC CORP., Sturtevant Div., 200 Readville St., Hyde Park, Boston 36, Mass.

Circle Inform-A-Gram No. C11.

"Machining of Armco Stainless Steels" containes 37 pages of stainless know-how, including data on grades of stainless steel, cutting rates, operating instructions for many types of machines and tools, tool compositions, tool selection and cutting fluids. It is liberally illustrated. ARMCO STEEL CORP., Dept. T&P, Middletown, Ohio.

Circle Inform-A-Gram No. C12.

"The Application of Cutting Fluids to Machining Operations" is available in reprint form from The Cincinnati Milling Machine Co. Written by R. B. Niebusch and E. H. Strieder, Cincinnati Milling Machine engineers, it describes general principles; applications on lathe-type operations and other types of machine operations, and grinding operations. Photographs and line drawings illustrate the text. Write to THE CINCINNATI MILLING MACHINE CO., Dept. T&P, Cincinnati 9, Ohio, and ask for Publication M-1739.

Inform-A-Gram No. C13.

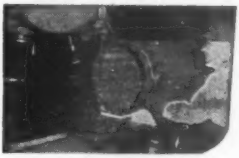
The Important Procedures of Tool Engineering are presented in a new book by Lawrence E. Doyle, Assistant Professor of Mechanical Engineering, University of Illinois. Economic problems, estimating, planning and many more subjects are detailed. Although primarily intended as a college textbook, "Tool Engineering" should give valuable insight into methods of analysis and reasoning to graduate engineers and others. Price is $6.35. PRENTICE-HALL, INC., 70 Fifth Ave., New York 11, N. Y.

"Principles of Centerless Grinding" has been brought up to date with new pictures by The Cincinnati Milling Machine Co. The third printing of Booklet G-503-2 contains over 40 pages of information on methods and advantages, operating controls and construction details, wheels, and other pertinent subjects. THE CINCINNATI MILLING MACHINE CO., Dept. T&P, Cincinnati 9, Ohio.

Circle Inform-A-Gram No. C14.

"Ordnance Production Methods" constitutes a collection of articles reprinted from MACHINERY. This book should prove useful because many of the methods developed during and just after World War II are applicable to the problems of the present emergency. There are 542 pages and over 1000 illustrations in this volume. Price is $10. THE INDUSTRIAL PRESS, 148 Lafayette St., New York 13, N. Y.

Cutting Hard-Tempered 1/8" Chrome Moley Steel



Sawing 16" Steel Piling

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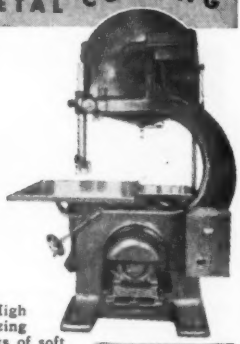

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. . . Casting Cleaning, from page 136
the small cast pieces and parts. An airblast room handled the larger castings. To replace and modernize cleaning procedures, two standard airless centrifugal-type blast cleaning machines have been installed: a large turn-table type to handle castings up to 1500 pounds (yokes, tables, bases, wheels, radiators), and a 7-foot rotoblast rocker barrel that handles all the pieces suitable for tumbling (parts for lathes, planers, surfacers, saws, radiators, oil coolers, and refrigeration and air conditioning equipment).

Parts and pieces that previously required 2½ to 3 hours to clean in the five tumbling barrels are now blast cleaned in the airless machine in 30 minutes, or approximately six times as fast. Larger castings, which are cleaned on the new "turn-style" table in 10 to 12 minutes, previously required 35 to 45 minutes in the airblast room—or three to four times as long.

This great increase in capacity to clean castings has permitted the transfer of two skilled men to other departments where their skills are needed today. It also meant that a long-planned preventive maintenance program could be activated, since cleaning time was cut sufficiently to allow time for required replacements and repairs.

By discontinuing use of the five tumbling mills, additional floor space has become available for other needed production facilities.

Because cleaning is done in less time, and because of the greatly reduced amount of handling of castings required in connection with the new equipment, full-time labor of two men is saved.

The high quality of the cleaning done by the new machines also improves production. Cleaner castings cut down grinding time and make inspection operations faster and more accurate.

Contributing, of course, to higher production is employee morale, noticeably higher with the reduction of handling steps involved in cleaning the castings, and with the practical elimination of cleaning in the airblast room.

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With the new, improved "HARDSTEEL" Drill, you can do accurate, smooth drilling, countersinking, counterboring and reaming in steels hardened by any process without first annealing the work. And they work with equal ease on work-hardening steels and high carbon—high chrome steels of any degree of hardness.

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1. Solvent discharged jet-like agitates tank for soak cleaning.

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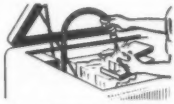

3. Stream of solvent thru hose used for flushing off parts and assemblies.

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SEE ADVERTISERS INDEX, PAGE 119, FOR KEY NUMBERS

BARGAINS! LONG DRILLS

9" Flute
12" High Speed 12"

Size	Price Each
1/8"x12"	$2.06
9/64"x12"	2.06
5/32"x12"	2.06
11/64"x12"	2.06
3/16"x12"	2.06
13/64"x12"	2.19
7/32"x12"	2.19
15/64"x12"	2.40
1/4"x12"	2.40
17/64"x12"	2.55
9/32"x12"	2.55
19/64"x12"	2.75
5/16"x12"	2.75
21/64"x12"	3.11
11/32"x12"	3.11
23/64"x12"	3.46
3/8"x12"	3.46
25/64"x12"	3.81
13/32"x12"	3.81
27/64"x12"	4.17
7/16"x12"	4.17
29/64"x12"	4.52
15/32"x12"	4.52
31/64"x12"	4.52
1/2"x12"	4.52

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KNOWN FOR THEIR PRECISION AND DEPENDABILITY.

SAVE WITH EASTERN

Dress your wheels accurately with long lasting diamonds. 7/16" x 6" shank furnished if not specified.

Carat	Price Complete
¼	$4.50
½	7.50
¾	10.40
1	14.80
1½	19.50
2	24.00
3	45.00
4	52.50

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from Surface, Tool, Cutter Grinders

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- 22 models
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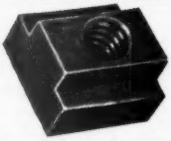

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STAR TYPE HAND KNOBS
HEXAGON TYPE HAND KNOBS
KNURLED HEAD SCREWS

Northwestern
116 HOLLIER AVE., DAYTON 3, OHIO

. . . Grinding Wheels, from page 136

The commercial use of electrical apparatus measuring the pitch of the ring of grinding wheels as a method of grading them was developed in connection with these sound studies. This method has been in standard use in the Norton Company's Grading Department for many years.

Originating in the Grading Department, a set of wheels was used for musical purposes in an industrial program aired by WTAG, a Worcester radio station, about 1937.

Ten years later in another radio show, "Queen-for-a-Day" program, the musical wheels were again played on the air from N. Y. City.

The following year Behr-Manning Corporation, a division of Norton Company in Troy, N. Y., indicated a definite interest in what by then had become known as the Norton "Wheel-O-Phone" for possible use at one of their service award dinners. A new set of wheels was made and several new wheels were added, bringing the total to twenty-one.

Wheels are carefully tuned by altering either the diameter or the thickness. Each wheel was mounted on a slightly inclined spindle supported by a wooden frame.

The "Cathedral Wheel - O - Phones" was developed and at the same time work began on a series of musical refractory crucibles similar in design to the familiar metal bells played by bell ringers at Christmastime. In 1948, these three instruments were played together in their first public performance at the Worcester Memorial Auditorium.

The "Wheel - O - Chimes" consists of thirteen Alundum wheels of varying sizes commonly used for glass grinding. The tones emitted closely resemble those of church bells. The "Cruci-Bells" are a collection of eighteen pure oxide refractory crucibles used in laboratories. The clapper of each "Cruci-Bell" is molded from Norace cement, while the handles are Norton mounted points with red Alundum abrasive for whole tones and Crystolon abrasive for the half tones.

THE VERY BEST IN

DIE CUSHIONS

NONE BETTER

For DEEP DRAWING
PAD CONTROL
KNOCK OUTS

Complete Engineering service at your disposal without obligation on all die cushion applications.

DAYTON ROGERS
Manufacturing Company
MINNEAPOLIS 7, MINNESOTA

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SAVE

TIME and MONEY

with

SUPERBAM

STOP-PINS
AVAILABLE IN 5 SIZES

FINGER STOPS
IN 3 SIZES

STOP-PINS are complete self contained units that hold securely in stripper plate. All sizes have 1/32" wall permitting insertion close to die or punch. No threads inside STOPS for springs to catch on. Write for literature and prices. SUPERBAM FINGER STOPS made in uniform width to fit any standard width slot. Just grind ends to fit. Write for literature.

TWENTIETH CENTURY MANUFACTURING CO.
3720 MONTROSE AVENUE CHICAGO 18, ILLINOIS

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"M" TEMPER ALLOY STEEL

for maximum machinability and minimum heat-treat distortion. It has great toughness at high degrees of hardness and long-wearing properties for lowest unit cost. For complete information on HY-TEN alloy steels, write for FREE DATA BOOK.

100 YEARS OF SERVICE. ROUNDS, SQUARES, FLATS, HEXAGONS,

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UNIVERSAL
TAP AND DIE GUIDE FIXTURE

$49.75 with 12 tap adapters No. 5 to ⅝"

Assures Good Threads
Maintains Correct Depth
3 Sizes
Free Folder

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BY A QUICK, EASY, INEXPENSIVE METHOD
Your business letterhead will bring literature.
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Wilmerding, Penna.

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Replace old style hand feed with revolutionary **ACRO-BORE BORING UNIT.**

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- Easily attached to BRIDGEPORT HEAD in ONE MINUTE.
- ACRO-BORE UNIT PLUGS INTO ANY 110-volt LINE.

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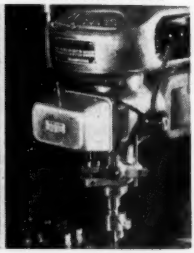
OLD WAY

SKYLINE WAY



SKYLINE TOOL & GAGE CO.
4127 NEWARK AVE. ● CLEVELAND 9, O.

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

. . . Coil Spring Grinding

average adjustment of only .008" to compensate for wheel wear for each hour of operation.

Handling time and floor space for work storage between passes are conserved because this machine produces finished springs during each cycle. Formerly, two or three passes were needed with conventional grinding equipment.

The new method also tends to obviate the need for secondary operations such as reaming or chamfering, squaring and scale testing. Abrasives and metal do not fuse around the end coils, there being an absence of heat during the grinding; the end coils do not run oversize because of metal flow.

Notable features incorporated are an electrically controlled hydraulic or fluid motor linked directly to the lead screw of the top head—micro switches which limit the up and down movement of the head—and counterweights to balance the top head.

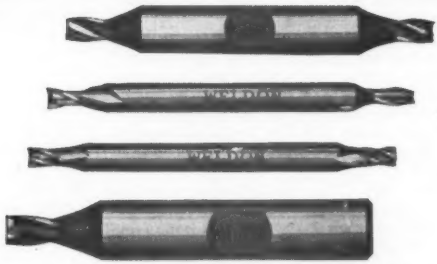
The grinding cycle is extremely simple: The operator loads the slowly rotating feedwheel which is driven by a fluid motor. The speed of the feedwheel is variable from 1/6 rpm to 19 rpm to suit operating conditions. Control valve is conveniently located.

After loading, the feedwheel rotation is increased to grinding speed and the down feed of the top head is started by push button control. There is little occasion for burn, as the feedwheel rotates at a speed that allows the abrasive to remove only a few thousandths of stock each pass.

When the required size is reached, a limit switch stops the downward travel of the head and a flashing amber light shows the operator that the grinding cycle is in the dwell or spark-out period. This period at the conclusion of the grind gives the springs a good finish and brings them to uniform size.

A traverse control button quickly returns the head to its top limit. The grinding cycle is then complete, the feedwheel is stopped, the hinged unloading panel is dropped and the feedwheel is slowly rotated to unload the springs by gravity.

YESTERDAY'S PIONEER . . . TODAY'S LEADER



WELDON

Stub Length Double-End End Mills

Stock Items

This line of small size end mills, in both double-end and single-end, with flutes shorter than regular, provides the following advantages:

GREATER STRENGTH • LONGER TOOL LIFE
FAR LESS BREAKAGE • FASTER FEEDS

Furnished in 2- and 4-flute styles

Weldon distributors throughout U. S. A. and Canada carry complete stocks to serve you

THE WELDON TOOL CO. Cleveland 4, Ohio

3000 WOODHILL ROAD

. . . Continued from page 135

16. Q. May a small businessman—say the owner of a shoe repair shop or a filling station—issue a DO-97 to obtain the supplies he needs to maintain his business and equipment in good condition?

A. Certainly.

17. Q. What does he have to do to use such a rating?

A. He merely writes on the order, or on a piece of paper attached to it, these words: "DO-97, Certified under NPA Regulation 4," and then signs his name.

18. Q. Does such a DO-97 carry the same priority value as other DOs' those issued by the armed services, for instance?

A. Yes, since all DO ratings have the same priority value.

19. Q. Suppose the operator of a furniture repair shop needs to get some sandpaper and hand tools. May he issue his own DO-97 to obtain these supplies?

A. Yes.

20. Q. After he has used a DO-97, what else must he do?

A. If he uses more than $1,000 worth of MRO per quarter, he must record the expense as a charge against his MRO quota, but if he uses less than $1,000 of MRO per quarter he need only keep a record of the transaction.

21. Q. Does every firm or institution using DO-97s have to keep records of its MRO purchases?

A. Yes. The NPA requires that all persons using the DO-97 rating must keep complete records and preserve them for the duration of this Regulation and two years thereafter.

22. Q. Is any particular accounting system required in these records?

A. No. Any system is satisfactory, provided that it will disclose the information needed by the NPA for an adequate audit.

23. Q. Is there any provision in the regulation for minor capital additions?

A. Yes. NPA permits the use of the rating for minor capital additions not exceeding $750 for any one complete capital addition.

24. Q. Can an example be given showing how this provision might work?

A. Yes. Suppose a shoemaker needs a new leather stitching machine. He may obtain the machine under a DO-97 rating, providing it does not cost more than $750.

25. Q. Nearly two months of the first quarter of 1951 are now gone. How does a person figure his MRO quota for the remainder of this quarter, up to April 1?

A. This is covered in Direction 1 issued in conjunction with Regulation 4. In general, it provides that the person must first figure his quarterly MRO quota. He is then allowed one-half of this amount as his quota for the remainder of this quarter. He does not have to charge his MRO expenditures so far this year against this quota.

26. Q. What if this quota for the remainder of the first quarter of 1951 is too small to permit a firm to obtain the MRO supplies it needs to fill DO-rated orders already on hand?

A. In that case the firm may file with the NPA an application for an increased quota, and it may consider this increased quota approved unless it is advised to the contrary by the NPA. One-half of this increased quota may be used prior to April 1.

27. Q. Is any provision made for quota adjustments in later quarters?

A. Yes. Any person may at any time file with NPA a request for adjustment on the ground that his MRO quota is not sufficient for his requirements, or that it works an undue or exceptional hardship on him not suffered generally by others in the same trade or industry, or that its enforcement against him would not be in the interest of national defense or the public interest.

28. Q. Suppose a firm has been granted an increased quota for MRO. Must it make a new application for each succeeding quarter?

A. No. Once an increased quota is established, this becomes the firm's standard quota, unless the increase was granted on a temporary or seasonal basis, or is otherwise restricted by NPA.

29. Q. Many firms have already placed nonrated orders for MRO supplies. May these firms now apply DO-97 ratings to them?

A. Yes, and the ratings will take effect as of March 15 if the firm applies the DO-97 to these outstanding orders before that date. All MRO orders carrying a DO-97 rating applied prior to March 15 shall take effect as of March 15, while all ratings applied on or after March 15 shall take effect as of the dates when applied.

30. Q. What if a machine repair shop is hired by the proprietor of a shoe shop to repair a machine. To whose quota are the repair parts used on this job charged?

A. The machine repair shop may use a DO-97 rating to the same extent that the shoe shop proprietor would be permitted to use it if he himself were repairing his own machine. The cost of the materials is charged to the MRO quota of the person for whom the work is done—in this case the shoe shop proprietor.

31. Q. Suppose a home owner needs to obtain repair parts for some equipment in his home. May he also make use of the DO-97 rating?

A. No. The rating may not be used to obtain materials for personal or household use. For example, a farmer may use a rating to obtain barbed wire for farm fences but he may not use a rating to obtain plumbing supplies for household use.

. . . Propeller Blades

nique of squeezing a white-hot, 400-pound, chrome-nickel-molybdenum steel billet through appropriate dies with a 550-ton press to produce a 200-pound, 10-foot propeller blade tube. This process, accomplished in three stages, contrasts with present time-consuming methods of welding together, brazing and forming two specially-processed flat plates, weighing 750 pounds before machining, to produce the same sized blade.

The rough propeller blade comes from the extrusion press in the form of a tapered - wall, seamless, round tube with "ears" or ridges running from the shank to the tip. In subsequent operations, the tube is flattened and shaped and the ears become the leading and trailing edges of the blade.

Application of the new process, Air Force and Curtiss - Wright officials declare, reaches beyond the aviation industry. On the basis of experience gained in the propeller blade development program, those who participated are of the opinion that the new methods have unlimited possibilities in other fields. Listed among items which can be produced by extrusion are landing gear struts, helicopter masts, helicopter or aircraft drive shafts, helicopter main rotor blade spars, gun barrels, tank parts, ship parts, and members for prefabricated structures such as bridges and towers.

The completed extruded blades are of the same hollow-steel monocoque design as the welded blades pioneered by Curtiss-Wright. Essentially rectangular in shape, they are widest at the tip which is square in accordance with modern practice.

There's a reason . . . 85% of all popularly-priced Tool and Cutter Grinders sold are "Knock-outs"

See why at your "K-O" distributor . . . or write for descriptive literature

K. O. LEE CO.
ABERDEEN, SOUTH DAKOTA

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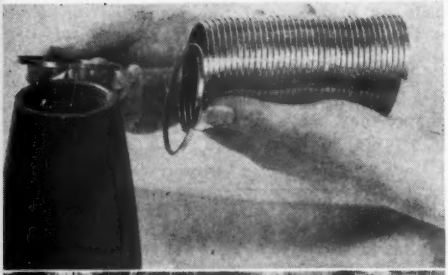
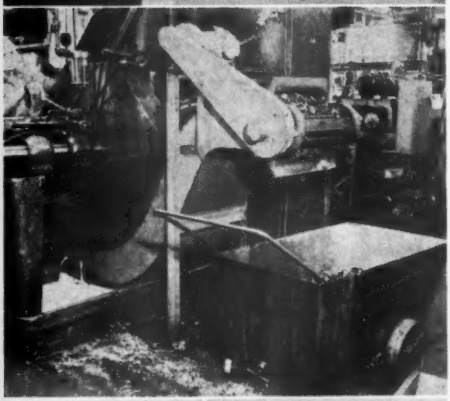
PROGRESS

NEW DEVELOPMENTS • IMPROVEMENTS • COST AND TIME SAVERS

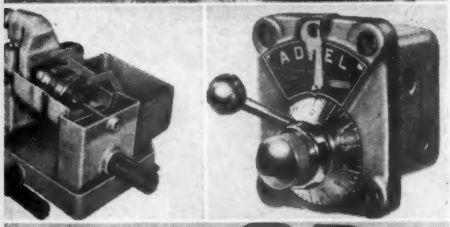


Flat Wire "No Tangle" Notched-Coil Silver Brazing and Soldering Rings for faster, more economical and improved brazing of projectiles and other ordnance equipment are now available from Lucas-Milhaupt. These flat wire preforms were designed for applications requiring larger volume of silver alloy for added strength in critical joints and where the depth and shape of the groove prohibited use of round wire rings. LUCAS-MILHAUPT ENGINEERING CO., 5051 S. Lake Drive, Cudahy, Wis.
Circle Inform-A-Gram No. A1.

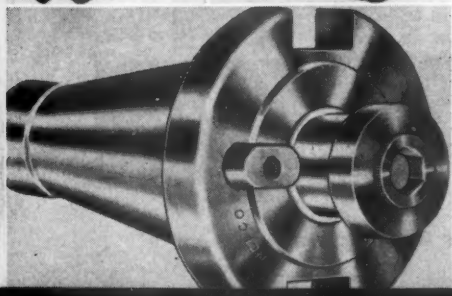


The "Chip-Tote" Conveyor is now offered in an improved model. This unit continuously removes metal chips, borings and turnings from operating automatic or multi-spindle machines and eliminates the need for periodic shut-down of equipment for manual scrap removal. Improvements include an adjustable clutch for increased safety and a formed steel hold-down that meters turnings, chips and other scrap passing up the conveyor belt. MAY-FRAN ENGINEERING, INC., 1726 Clarkstone Rd., Cleveland 12, Ohio.
Circle Inform-A-Gram No. A2.

The New Houdaille Magnetic Clarifier (outside cut) removes over 98% of contaminants from liquid coolants and provides continuous delivery of clean coolant to machine sump for re-use. Removal of metallic and abrasive particles is accomplished by use of permanent ring magnets completely enclosed in revolving non-magnetic cylinder. HONAN-CRANE CORP., 208 Indianapolis Ave., Lebanon, Ind.
Circle Inform-A-Gram No. A3.



Adel's New Hydraulic Flow Control Valve (inside cut) is a versatile, 1500 psi, compensated type valve that maintains constant flow over a wide differential pressure range. It is adjustable from completely shut off position to 25 GPM maximum flow. No drain line is required. Full particulars may be obtained by writing to ADEL DIV. of GENERAL METALS CORP., 10777 Van Owen St., Burbank, Calif.
Circle Inform-A-Gram No. A4.



Shell Milling Cutter Type C Arbors are announced by Nelco Tool Co. This arbor requires no special wrench, as all sizes are equipped with socket head standard lock screws. It is universally adaptable to milling machines and cutter grinders having National Standard Spindle Tapers and is available in ½" and 2" diameters. NELCO TOOL CO., Dept. T&P, Manchester, Conn.
Circle Inform-A-Gram No. A5.

ON PARADE

Mail FREE Inform-A-Gram Card for MORE Details.

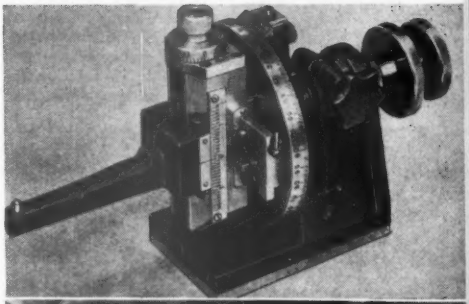
The New Tangi-Matic Dresser for precision dressing of all angle-tangent-to-radius grinding wheel forms is in production by Perfex Tool & Gage Co. A built-in micrometer provides direct reading, rapid adjustments and accuracy down to "tenths." Setting for required angles is provided by a vernier scale, graduated in minutes. PERFEX TOOL & GAGE CO., Dept. BE, 123 Avery St., Mt. Clemens, Mich.
Circle Inform-A-Gram No. A6.

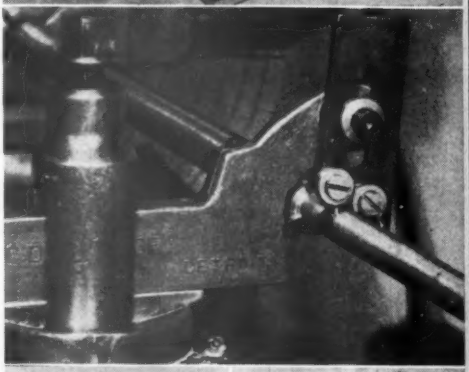
The Followrest Lathe Tool Holder, introduced by Dasso Tool Products, prevents chattering, climbing and runouts and assures greater accuracy. It is completely adjustable for various diameters. Body of holder is 5/8" x 1⅜" x 6¾", and it takes a 3/8" tool bit. The illustration shows a 5/32" cut being made on a tool steel shaft ⅞" in diameter and 30" long. DASSO TOOL PRODUCTS, Box 13, Lincoln Park, Mich.
Circle Inform-A-Gram No. A7.

Hand Operated Presses (inside cut) for light manufacturing assemblies, formerly comprising the Boering Tool line, are now being produced by I. H. Bradley & Sons. Two sizes are available: the larger weighs 22 lbs., has an adjustment of 1½" and a stroke of ⅞"; the smaller weighs 6½ lbs., has a 1" adjustment and a ½" stroke. Both units can be modified for foot pedal operation. I. H. BRADLEY & SONS, 264 Fifth St., Bridgeport, Conn.
Circle Inform-A-Gram No. A8.

Model P-5 Portman Optical Projector (outside cut) incorporates many advanced features including simplicity of operation, full size standard 14½" diameter image screen, large working stage area and exceptionally clear light at all magnifications. It is intended for all classes of optical projection work. PORTMAN INSTRUMENT CO., 6 Manhasset Ave., Port Washington, N. Y.
Circle Inform-A-Gram No. A9.

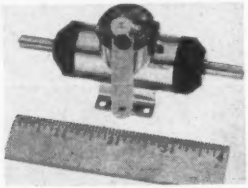
A New Bench Lathe designed to handle small and light work is being made by Hamilton Products, Inc. It is equipped to turn small shafts with or without centers and may be operated with a ¼ hp, 1750 rpm motor. Bed length is 26" with a cutting range of 18½". It has double V-ways. The compound swivels 360° on a pilot and is locked with two T-slot bolts. This lathe may be used on second operations, etc., thereby releasing more expensive heavy equipment. HAMILTON PRODUCTS, INC., Dept. A, 12416 Euclid Ave., Cleveland 6, Ohio.
Circle Inform-A-Gram No. A10.



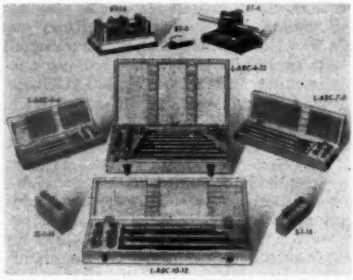


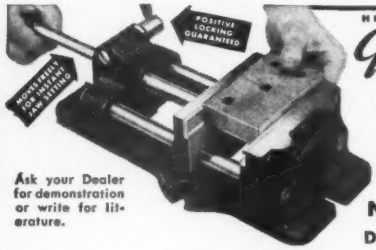
The Graco Lube Service Cart is a compact and highly maneuverable, two-wheeled grease rig for dispensing lubricants to industrial bearings. Since all grease and oil equipment on the rig is removable, even remotely located machines that are inaccessible to the cart can be greased with the equipment. GRAY CO., INC., 200 Graco Square, Minneapolis 13, Minn. **Circle Inform-A-Gram No. A11.**

Metron Type 4B Miniature Speed Drive features lever types speed control. Advantageous in applications requiring remote or automatic control, the 4B is a small, compact, sealed unit with ratings up to 2-pound-inches of torque, 0.025 hp and 20,000 rpm. METRON INSTRUMENT CO., 432 Lincoln St., Denver 9, Colo. **Circle Inform-A-Gram No. A12.**



Large Sizes of Bokum Cutting Tools for Lathes are now available in sets put up compactly in sturdy wooden boxes arranged in popular size assortments. The sets illustrated here include cutters for boring, bottoming, facing and internal threading. Complete details on set number designations and the diameter ranges can be had from BOKUM TOOL CO., 14775 Wildemere, Detroit 21, Mich. **Circle Inform-A-Gram No. A13.**





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HEINRICH Grip-Master

GRIPS WITH SPEED CUTS TOOLING COSTS

Step up drill press production with the Heinrich "Grip-Master" Screwless Vise—with the patented "Circle Grip" hammer blows cannot break. Work is automatically leveled; jaws set instantly, effortlessly. 3", 4", 6", 8" jaw widths; ideal as base structure for drill jigs and fixtures.

NATIONAL MACHINE TOOL CO.

DEPT. 131-E RACINE, WISCONSIN

RUNS COOL AT 38,000 RPM

Roto-Master Hi-Speed grinder makes carbide roughing and finishing available to every shop. Designed for operations requiring precise "finger-tip" control, in conjunction with carbide burrs and mounted wheels from 1/16" to ¼" dia.

MAKES CARBIDE ROUGHING AND FINISHING AVAILABLE TO EVERY SHOP

Roto-Master's SUPER COOLING system enables operating speed of 38,000 RPM. Operation requires practically no pressure . . . consequently grinder can be used continuously for hours without heating.

Operates on 110-120 Volt AC or DC, Any Cycle.

Try Roto-Master in your shop. If not completely satisfied return within 15 days at no charge. If not rated send check or M. O. for $32.50. Manufacturers' Agents Wanted.

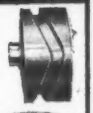
$32.50

MASTER APPLIANCE MFG. CO., 4th at Ontario, Racine, Wisconsin

EISLER JIG BORING

CAM MILLING

A SPECIALIZED ROWBOTTOM CAM MILLING SERVICE... JIG BORING... SPOT WELDING... CONTRACT PRODUCTION ...EXPERIMENTAL DEVELOPMENT



EISLER ENGINEERING CO., INC.
732 S. 13th Street (Avon Ave.)
Newark, N. J.

CHICAGO DIES

Complete Line of PUNCHING and FORMING DIES for All Sizes and Makes of PRESS BRAKES

DREIS & KRUMP MANUFACTURING COMPANY

7428 S. Loomis Blvd., Chicago 36, Ill.

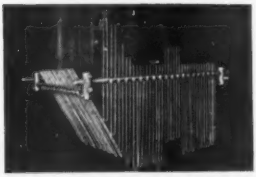
HARDENED and GROUND HSS BLANKS

Any decimal diameter to ½"—in any length. Mirror finish surface to gage tolerance. Many uses — punches, gages, measuring wires, special tools, etc. Quick delivery.

Write for price list D-1.

WILLIAM T. HUTCHINSON COMPANY
235 Main St. Orange, N. J.

ADJUSTABLE ROD GUARD for Power Presses



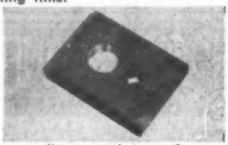
HUMM SAFETY EQUIPMENT CO.
MFGRS. OF COMPLETE LINE OF PRESS GUARDS
253 Sheffield Avenue • BROOKLYN 7, N. Y.

HERE'S THE ANSWER TO ALL YOUR HEAT-TREATING PROBLEMS!

Prevent —
SCALE
PITTING
DISCOLORATION
Save —
COSTLY POLISHING —

GET CLEAN, SCALE-FREE RESULTS EVERY TIME!

Above is a die, heat treated under ordinary conditions. Note—scale, pitting and decarburization necessitating hours of costly polishing time.



The same die treated in a few seconds with PHOENIX-BRAND NON-SCALING COMPOUND. Note — clean, scale-free surface — No polishing necessary.

PHOENIX-BRAND Non-Scaling Compound is a specially compounded powder that can be sprinkled or brushed on dry. During the heating process, it forms a protective coating sealing out atmosphere and protecting the piece. Coating breaks off like an egg shell when water quenched; when oil quenched — boiling for a few minutes in plain water dissolves coating, leaving shiny original surface underneath. No messy pack — *not a salt solution*. Solve heat treating problems in seconds.

2 lb. can — $ 6.00
5 lb. can — 15.00
15 lb. can — 41.25
25 lbs. or more — $2.50 per lb.

AT YOUR MILL SUPPLIER — OR WRITE

THE PARKER STAMP WORKS, Inc.
Established 1871
HARTFORD, CONNECTICUT

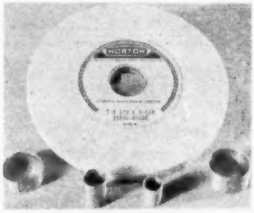
SEE ADVERTISERS INDEX, PAGE 119, FOR KEY NUMBERS

The Brennen Portable Band Saw Welder handles the new .050" diameter contour-cutting

band saw blade, as well as all types of blades up to ½" flat. Because of its wide range, this welder is particularly useful for tool and die work. It is fully automatic, and there are no tension adjustments or knobs to turn. BRENNEN MFG. CO., 228 Seeley St., Brooklyn, N. Y.

Circle Inform-A-Gram No. A16.

Precision Bushings for Grinding Wheels are the latest development of Norton Co. This new patented bushing is pressed into the wheel, insuring greater holding power of the bushing in the wheel. The light weight of the new bushing, and its uniformity of size, preserve



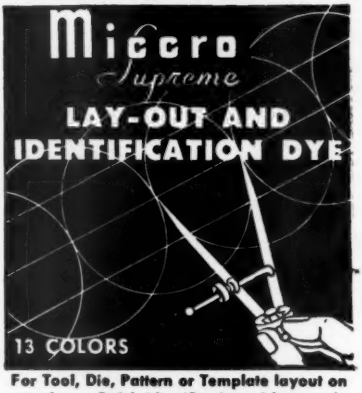
the inherent balance of wheels made by Norton's new manufacturing process. NORTON CO., 1 New Bond St., Worcester 6, Mass., will provide details.

Circle Inform-A-Gram No. A17.

HOGGSON BRAND
Since 1849
HAND-CUT
Steel Stamps
Letters and Figures
At mill Supply Houses

HOGGSON & PETTIS MFG. CO.
141D Brewery St. New Haven 7, Conn.

Miccro Supreme
LAY-OUT AND IDENTIFICATION DYE



13 COLORS

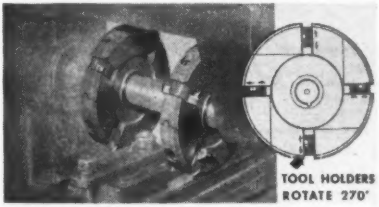
For Tool, Die, Pattern or Template layout on metal . . . Quick identification of bar stock, sheet, strips or parts . . . Shows up in sharp relief—dries instantly . . . Write for sample and circular on company letterhead.

MICHIGAN CHROME & CHEMICAL COMPANY
6340 E. Jefferson Ave. • Detroit 7, Mich.

A New Single-Purpose, Swiss Automatic Screw Machine is announced by Carl Hirschmann Co. The Tornos Automatic Type TV, made specifically for the high-speed production of very small precision screws, features a combination of four radial tools for the turning, forming or cutting-off operations, a very sensitive threading spindle, and a slotting attachment of new design. CARL HIRSCHMANN CO., 30 Park Ave., Manhasset, N. Y., will supply details.

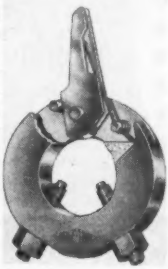
Circle Inform-A-Gram No. A18.

The Newfield Fly Cutter permits four to six cuts from 3/16" to 2" in width in one operation for many types of milling, including light metals and plastics as well as steel. It fits all standard arbors and turns at any required speed for fly and gear cutting, slotting, surface and straddle milling, and disc and gasket cutting. Standard bits can be used. Holders take bits from 5/16" to ½" diameter and are held securely in position by one Allen Screw. NEWFIELD MACHINED PARTS CO., 210 W. Seventh St., Los Angeles 14, Calif.

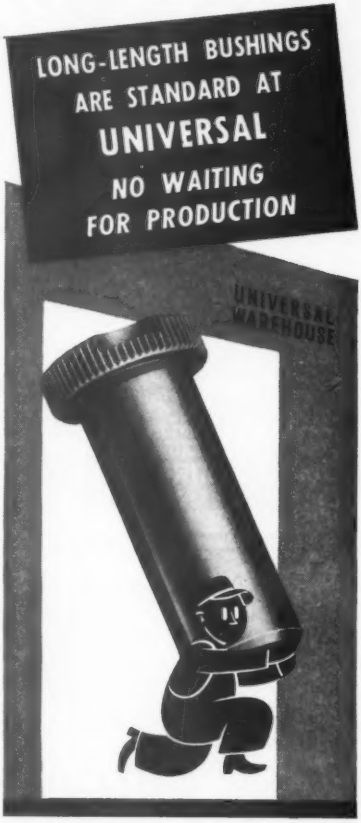


Circle Inform-A-Gram No. A19.

"Cam Action" Grinder and Lathe Dogs of Ready Tool Co. can save time and labor, particularly on semi-automatics and where there is little traverse feed. They are easy to adjust with instant, positive action. A concealed spring holds the cam to the work. For grinders, the cam face is accurately ground smooth, positively protecting work from mars. For lathes, the cam face is serrated to prevent slipping. READY TOOL CO., 550 Iranistan Ave., Bridgeport, Conn., can provide more information.



Inform-A-Gram No. A20.



All long-length bushings listed as standard in the Universal Catalog are regular stock items, which means speedier delivery to you.

146B

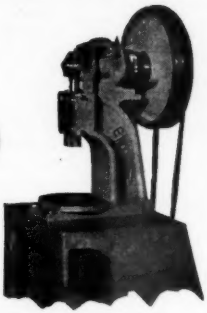
UNIVERSAL
ENGINEERING COMPANY
FRANKENMUTH 9, MICHIGAN

SEE ADVERTISERS INDEX, PAGE 119, FOR KEY NUMBERS

"FRAY"
MICROMETER
OFFSET BORING HEAD
It's safe—no projections. Smooth, rounded edges.
Easily read graduations.
Two boring bars supplied with each head.

WRITE FOR DETAILS
Produced under Patent 2305737
FRAY MACHINE TOOL CO.
515 W. Windsor Rd., Glendale 4, Calif.

Get all the facts about the
EMCO
POWER PUNCH PRESS



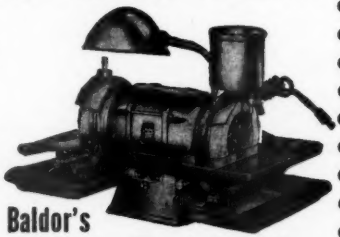
Built and performs like a big press. Up to 18,000 operations per hour. Two sizes, "W" and "X"; 5 and 10 ton capacity, respectively. No repeating. Compact, powerful, long-lived, foolproof. Hundreds of pleased users.
Write for new bulletin and prices.
KLAAS MACHINE & MFG. COMPANY
4312 East 49th St., Cleveland 25, O.

FASTER AUTOMATIC DRILLING at NEW LOW COST

X-750
NEW KAM-GRIP DRILL JIG!
Ingenious engineering changes in the NEW manually or automatically operated Kam-Grip Drill Jig result in easier and faster adjustability, as well as greater accuracy where close tolerance drilling is required. Reducing set-up time, cutting costs and increasing production.

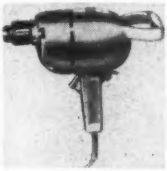
WRITE for free catalog of complete line of Kam-Grip Jigs and Milling Fixtures.
MANUFACTURERS ENGINEERING SERVICE, INC.
SECURITY BLDG. • TOLEDO, OHIO

For Precision Work . . .



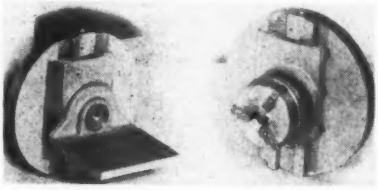
Baldor's
Carbide Tool Grinder
has balanced armature and wheels, runs smoothly on LARGE ball bearings. Grinds wet or dry. ½ hp 3400 RPM reversible motor; 6" silicon carbide wheels. Complete price, $142.60.
Baldor
BALDOR ELECTRIC CO.
— Over 30 Years —
4350 DUNCAN AVE.
ST. LOUIS 10, MO.

Two New Heavy Duty Drills. Model 427 ¼" (pictured) and Model 230 ⅜" have been added to the line of Cummins Portable Tools. Model 427 is designed for constant production drilling of tough metals. Model 230 performs fast drilling of all metals in production and maintenance operations. CUMMINS PORTABLE TOOLS, Div. of Cummins - Chicago Corp., 4740 N. Ravenswood Ave., Chicago 40, Ill.



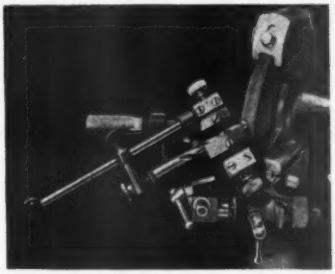
Circle Inform-A-Gram No. A23.

A New Face Plate for Small Lathes. with boss on an adjustable slide, saves setup time and enables an ordinary lathe having a 1½"-8 pitch thread to accurately machine regular and odd shapes, and do offset work. By moving the slide and rotating the fixture on the boss, any point of work can be brought to exact spindle center quickly. MICRO LATHE PLATE, INC., 1265 W. 2nd St., Cleveland 13, Ohio.

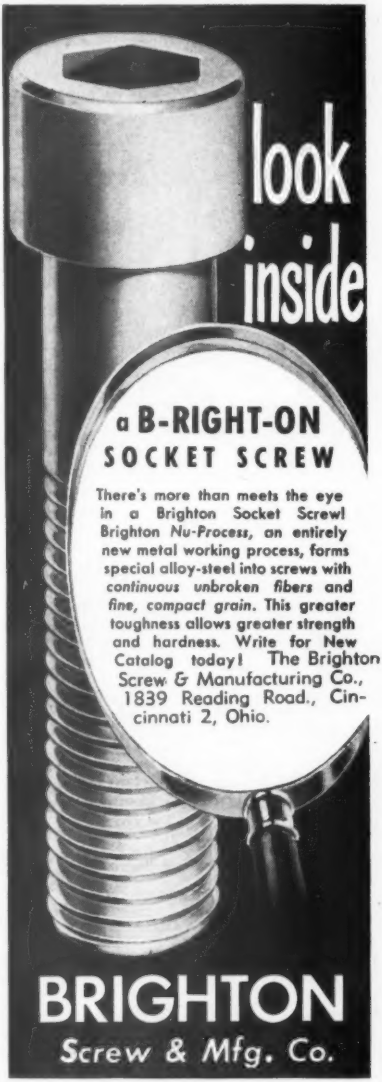


Circle Inform-A-Gram No. A24.

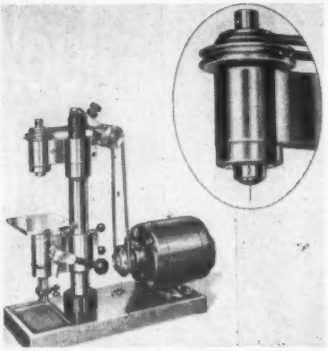
Delta's No. 1298 Drill Grinding Attachment sharpens steel drills of any size from ⅛" to ⅝", using a standard tool grinder. Simple to operate, this device produces correctly ground 2, 3 or 4 lip drills. Micrometer adjustments are provided. Spline shafts are used to provide rigidity in any position. DELTA POWER TOOL DIV., Rockwell Mfg. Co., 600 E. Vienna Ave., Milwaukee 1, Wis.



Circle Inform-A-Gram No. A25.


look inside
a B-RIGHT-ON
SOCKET SCREW
There's more than meets the eye in a Brighton Socket Screw! Brighton Nu-Process, an entirely new metal working process, forms special alloy-steel into screws with continuous unbroken fibers and fine, compact grain. This greater toughness allows greater strength and hardness. Write for New Catalog today! The Brighton Screw & Manufacturing Co., 1839 Reading Road., Cincinnati 2, Ohio.
BRIGHTON
Screw & Mfg. Co.

The Levin Micro Drill Press is designed for drilling holes as small as .002". So that drills run true, the spindle of this drill press holds collets of the same type as those used in the Levin jewelers' lathes. Thus, drills as small as .022" diameter can be held in a proper size collet with the assurance that they will run true. These collets are available

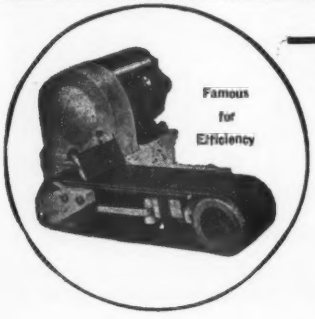


from stock in sizes as small as .004". LOUIS LEVIN & SON, INC., 782 E. Pico Blvd., Los Angles 21, Calif., will furnish literature.
Circle Inform-A-Gram No. A26.

Black Granite Surface Plate. "Micro-Flat," a new type of precision surface plate made of black granite, with accuracy up to 50 mil-

lionths of an inch, is announced. It is non-magnetic, non-deflecting, non-glaring and requires no oiling. "Micro-Flat" allows bench workers engaged in tool and die making to lay out work on an extremely smooth surface that is non-erosive. Sizes range from 9" x 12" to 54" x 108" COLLINS GRANITE SURFACE PLATE CO., 1331 Santa Fe Ave., Los Angeles 21, Calif.
Circle Inform-A-Gram No. A27.

"THE ORIGINAL"
MAUSER
MAUSER PRECISION VERNIER CALIPER
$14.75 PPD
MONEY BACK GUARANTEE
FOR MEASURING INSIDE, OUTSIDE, AND DEPTH.
3 GRADUATIONS
1/1000" — 1/128"
1/10 mm. IN BACK
NEW EXCLUSIVE CAMLOCK AND GIB IMPROVEMENT INSTANTLY FIXES SETTING, PREVENTS SHIFTING, GUARANTEES SQUARENESS OF JAWS.
THE MAUSER TRADEMARK... IS YOUR PROTECTION.
GEO. SCHERR CO., INC.
200-T LAFAYETTE ST. • N.Y. 12, N.Y.



• HIGH SPEED GRINDING •

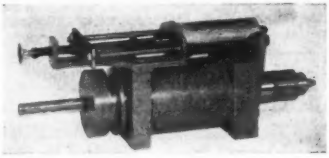
STANDARD D-4 ABRASIVE BAND GRINDER

This new, streamlined bench type grinder assures fast, quality finishing on metals, plastics, wood, fibre . . . at low cost. Built to machine tool specifications, Standard D-4 is equipped with improved band tension control and specially designed protective motor hood. 4x36¼" band. The ideal portable unit!

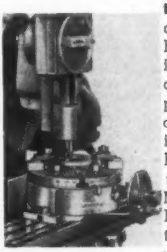
Other styles and sizes in New Manual on finishing — Write today

WALLS SALES CORP.
333 Nassau Avenue Brooklyn 22 New York

The HyPneuMat is a high speed, precision automatic drilling and tapping unit that utilizes either hydraulic or pneumatic power, offers one stroke or continuous cycling, has a rotating and reciprocating spindle, and permits speeds up to 20,000 rpm. It is practical for light, precision and heavy duty work.

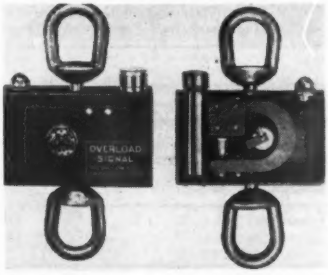


HyPneuMat INC., 647 W. Virginia St., Milwaukee 4, Wis.
Circle Inform-A-Gram No. A28.

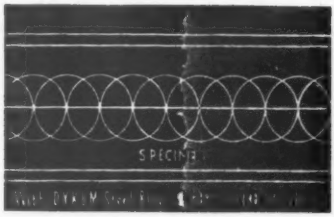


The New Marvin Slotting Attachment possesses a positive drive, regardless of rate of speed. It is equipped with a roller chain that eliminates slippage and allows heavy cuts. Operator protection is provided by a safety hood mounted over the transmission. MARVIN MACHINE PRODUCTS, INC., 414 Ford Bldg., Detroit 26, Mich., will provide additional information on this new slotter.
Circle Inform-A-Gram No. A29.

The Dillon Overload Warning Signal is designed to protect hoists and cranes as well as the life of the operator in those installations where it is not desirable to cut into the hoist motor circuit but where some method of



overload warning is essential. The unit is pictured with protective cover in place and removed. Write for data sheet to W. C. DILLON CO., INC., 1421 S. Circle Ave., Forest Park, Ill.
Circle Inform-A-Gram No. A30.



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STOPS LOSSES
making dies and templates

Simply brush on; ready for the layout in a few minutes. The dark blue background makes the layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information

THE DYKEM COMPANY
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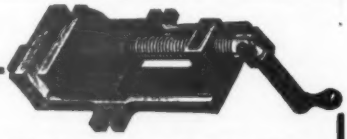

YOST DRILL PRESS VISE

● This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

OFFERED IN TWO SIZES

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	4	12½
2D	5	5½	23

Do you need a vise of ANY type?

Write today for bulletin on the extensive Yost line

YOST MFG. COMPANY
1000 MAIN STREET
MEADVILLE • PENNSYLVANIA

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CONTRACT TOOLING AND PRODUCTION

Illinois

DRESEL-BETZ CO.
Belleville, Ill.
Designers and Manufacturers of Tools, Dies, Jigs, Fixtures, Metal Stampings.

Michigan

DAVIS TOOL AND ENGINEERING CO.
19250 Plymouth Road, Detroit, Michigan, VErmont 5-6000. Tools and Dies, Special Machinery. Sheet Metal Stampings and Assemblies.

New York

AMERICAN MEASURING INSTRUMENTS CORP.
240 West 40th St., New York 18, N. Y. Jigs fixtures, gages, dies, precision parts.

CONRAD & MOSER
2-23 Borden Ave., Long Island City, N. Y. Machine Tools & Molds, Parts & Machines Aluminum Cast Parts, Aluminum Sheet Formed Housings.

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DESIGNERS AND BUILDERS
Jigs and Fixtures Special Machines
Production Engineering
Complete Plant Routing and Tooling

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2067 W. 55th St., Cleveland, O., WOodbine 4736. Dies, Tools, Jigs, Fixtures, Light Stampings, Special Machinery Manufacturing.

H & P DIE & STAMPING CO.
13947 Triskett Rd. Cleveland 11, Ohio
PRECISION DIES, JIGS & FIXTURES
Quality Stampings
Bus & Trailer Parts

THE INDUSTRIAL MACHINE CO.
1436 East 47th St., Cleveland, O. Founded in 1908. Builders of Special Machinery. General Machine Work.

KIFFER TOOL & DIE CO.
5601 Tillman Avenue, Cleveland, Ohio, WOodbine 2440-2441. Manufacturers of Special Machinery, Tools, Dies, Jigs, Fixtures, Swiss Jig Boring.

NOBLE & STANTON, INC.
998 Broadway, Bedford, Ohio, Bedford 1234. Tool Makers—Short Run Production Work.

THE PHOENIX MACHINE CO.
2711 Church Ave., Cleveland, O., CHerry 1048 Contract Grinding, Boring and Planing. Lester-Phoenix Die Casting and Plastic Molding Machines.

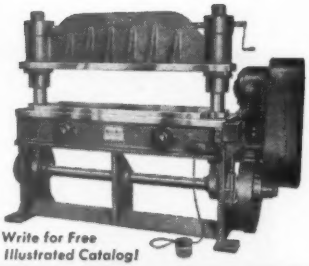
A. P. SCHRANER & CO.
3338 Payne Ave., Cleveland, O., HEnderson 8644. External Cylindrical Lapping Machines, Special Machinery, Tools, Dies, Jigs, Fixtures.

DIAMOND

Multi-Max Punch Presses

. . . for Fast Production on Light-Gauge, Large-Panel Metal Stampings.

- 30 TONS RATED CAPACITY
- 80 STROKES PER MINUTE
- BED AREA: 16" x 48"
- WEIGHT: 4,150 LBS.



DIAMOND MACHINE TOOL COMPANY
3425 E. OLYMPIC BLVD., LOS ANGELES 23, CALIF.

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SAVE YOUR DIES

DURANT *Stock Oiler*

DURANT TOOL SUPPLY CO.
155 ORANGE ST., PROVIDENCE 3, R. I.

REID

SURFACE GRINDERS

REID MODEL ILLUSTRATED:
518 V, WITH VARIABLE TABLE SPEED 112 TO 35 FEET PER MINUTE)

SEND FOR CATALOG AND PRICES ON ALL MODELS

REID BROTHERS COMPANY, INC

MILWAUKEE DIE FILERS PROFILE GRINDERS

Cut Tool and Die-Making Costs!

DIE FILER
Model FS with new All-Purpose, Deep - Throated Overarm performs all tool and die - making operations at low cost.

PROFILE GRINDER
Built for precision grinding. Available in two models, STANDARD and HIGH SPEED, for mounted stone wheels and diamond or carbide wheels respectively.

RICE PUMP & MACHINE COMPANY
228 N. Milwaukee St. Grafton, Wisconsin

SEE ADVERTISERS INDEX, PAGE 119, FOR KEY NUMBERS

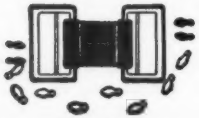
TYPE TD

10 TD 10" 14 TD 14"

TWIN WHEEL TOOL GRINDER
(Also single cup wheel)

The World's Most Modern Grinder For Carbide, Stellite, or High Speed Steel Tool's . . . .

HEAVY DUTY, WET OR DRY, 10"-14" WHEELS



OLD WAY

Lost time between rough and finish grind.

Floor space wasted — Grinder must be away from wall.

NEW WAY

One step from rough to finish grind.

Conserve floor space— place Grinder against the wall.

Positively no spray or splash when grinding wet!

WRITE TODAY FOR BULLETIN 18

Visit our Booth No. 103, Triple Industrial Supply Convention, San Francisco, Cal., June 11, 12, 13.

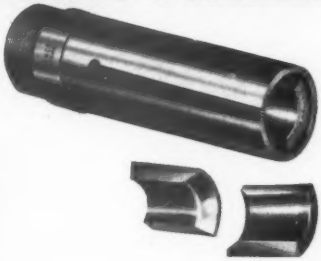
THE STANDARD ELECTRICAL TOOL CO.

MT. HOPE AND SIXTH STREET CINCINNATI 4, OHIO

starting from scratch
WITH MARSHALL PRECISION GROUND FLAT STOCK
The world's largest range of sizes of precision ground tool steel in three grades are available, ready for immediate shipment and the layout bench.
★ WATERcrat: A fine grained electric furnace high carbon tool steel. It has been wet ground to remove all bad surfaces and to assure velvet finish of virgin metal.
★ OILcrat: An outstanding product of careful handling assures you of a fine grained electric furnace oil hardening ground flat stock ready for the layout bench.
★ AIRcrat: This air-hardening tool steel shows less size change and offers a greater safety in hardening than either of the other grades. Dept. TD.
Write for descriptive literature, catalog of sizes and prices.
MARSHALL STEEL CO.
LA GRANGE, ILLINOIS
The Aristocrats of Ground Tool Steel

the right combination for better production

BENCO COLLETS + BENCO PUSHERS



You reduce set-up time when you use Benco Master Collets as the pads are quickly changed without removing the collet from the spindle. As a result, your machines turn out more and better work, regardless of the type of stock.

The Benco "CB" Master Collets use the only pad that can be interchanged with any other pads intended for "CB" Collets of the same machine capacity, regardless of the make of machine. They are used as standard equipment by National Acme on machines up to 3½" capacity.

Benco Master Collets grip tighter, run true and work faster—their concentricity is assured through precision manufacturing and rigid inspection. Insist on Benco Collets and watch production figures go up and rejects go down.

Benco Master Pushers solve difficult feeding jobs—increase production—reduce stock waste.

The pads in the Benco Master Pushers are held firmly in position at all times by a locating pin in the pusher and a drilled hole in the pad. The pads will not revolve in the pusher, eliminating friction and wear, thus resulting in longer life for both the pusher and pad.

The Benco Master Pusher is opened by means of an expansion screw, preventing possible breakage and controlling the size of the opening desired. Pads may be changed without removing the pusher from the tube... saving time and eliminating wear on the tube threads.

Equip your machines with Benco Master Pushers and get extra output at lower costs.

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BENCO COLLET MANUFACTURING CO.

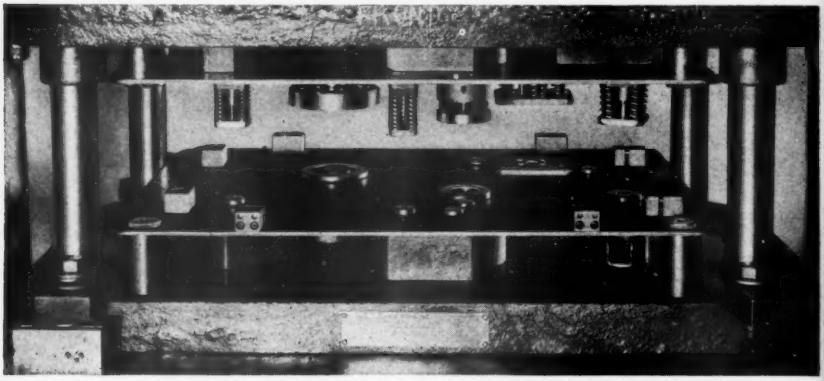
1559 EAST 27th STREET CLEVELAND 14, OHIO

Always Better Constructed

Accurate Benco Collets, Pushers and Pads

BENCO

Magnetic PERFORATING DIES



● Magnetic Perforating Die set-up in small inclinable punch press.

NEW and FAST METHOD for perforating Sheet Metal

● Die retainers complete with bushings being inserted in die template.

SAVE PRESS DOWN TIME. Approximately 15 minutes required to change from punching one subject of say 20 holes to a different 20 hole arrangement. Whistler Magnetic Perforating Dies *increase* press production.

HOLD CLOSE TOLERANCES. Hole centers may be held to .0005″ accuracy or as close as can be jig bored.

GREATER PUNCH AND DIE LIFE. Concentricity of punch and die assured thus giving uniform clearance around punch, increasing punch and die life.

SAVE FLOOR SPACE. Die storage cut to a minimum because only the 2 locating templets are stored...all that is required to duplicate the set-up.

REDUCE DIE COSTS. Whistler Magnetic Perforating Punch and Die units are used repeatedly for different hole arrangements. When completing one job, remove all units from templet and put them into service on the next different set-up. Combine any numbe. of hole sizes and shapes. Punch and die costs are amortized over continued re-use in many jobs.

Write for Catalog **Whistler Magnetic Perforating Punches and Dies have *proven* their cost-cutting advantages in many prominent plants. The catalog shows how. Send for it today.**

S. B. WHISTLER & SONS, Inc.

748 Military Road, Buffalo 17, N. Y.

Also manufacturers of a complete line of drawing, forming, blanking and progressive dies to special requirements.